Journal Of The Department Of Anthropology

VOLUME : 3 JUNE : 1996 NUMBER : 1

UNIVERSITY OF CALCUTTA

JOURNAL OF THE
DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF CALCUTTA

35, BALLYGUNGE CIRCULAR ROAD
CALCUTTA - 700 019

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DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF CALCUTTA
35, BALLYGUNGE CIRCULAR ROAD
CALCUTTA - 700 019

PRINTED BY

CALCUTTA UNIVERSITY PRESS
HAZRA ROAD
CALCUTTA -700 019

VOL. 3 NO. 1

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JOURNAL OF THE DEPARTMENT OF ANTHROPOLOGY UNIVERSITY OF CALCUTTA

CIS 5030

102/3

CALCUTTA
1996

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EDITORIAL

The Journal of the Department of Anthropology (JDA), Calcutta University is the departmental organ to communicate research focus of the department and other institutions interested in anthropological researches. It usually comes out half-yearly in the months of June and December respectively in each year. It hopes to accommodate all kinds of original and empirical works in anthropology based mainly on primary data. It is the privilege of the department to involve in exchange programme with other Institutions who have similar Journals or Newsletters.

It is a proper place to indicate some of the bright patches which are flickering in the movement of research and teaching in the Department of Anthropology, Calcutta University. In last two decades the existing members of the teaching staff did researches in several fields. The nature and character of these researches have touched the trends of global interest. In this regard Department of Anthropology is fortunate to admit a good band of students for last two decades and to receive the financial supports for the researches from Univerisity Grants Commission, ICMR, DST and Calcutta University as a whole. The research and teaching standard have improved a lot from earlier times using better facilities and with the incoming of good scholars with aptitude of researches.

The teachers of the Department have been presenting their research findings together with their scholars in National and International Seminars and Symposiums to keep their research trends open. In the fields of physical anthropology the trend of researches in the department are mainly concerned with Human Genetics, Cytogenetics and Dermatoglyphics. The department faces difficulty to accommodate everybody who expresses the desire to do research in the Laboratory of Human Genetics for want of space and finance.

In the field of social and cultural anthropology main areas of researches are the study of Indian civilization, economic anthropology, social stratification, social demography and development of weaker section. Recently gradual interest is mounting to do research on various problems of mentally retardates. The researches in these areas are indicative of improved research trends. Our teachers are invited to act as co-guide to research workers of other organisations.

Our teachers are also invited by other universities to deliver series of lectures on topics of their researches. Similarly the students are exposed to field-work in social and cultural anthropology in bigger scales than previous times. The perception of theoretical framework of reference and concepts is taught to utilize during field-work training. Relevancy, validity of data and emic view are considered adequately. The standard of field-work has been elevated in nature and content. The qualitative and quantitative aspects of field-work have been considered with equal importance. The semantic domain is considered to understand the aspect of cognition of the folk. It is a recent inclusion in field-work methodology.

In prehistory and palaeoanthropology the students are exposed to the situation of exploration. The teaching about artifacts and their particulars with metric value are not confined to laboratory only but extended to site exploration. Two decades earlier it was not possible for want of teachers and financial support. The teachers in prehistory and palaeoanthropology are adequately equipped with the method of teaching and research of good standard.

The department has been utilizing for last two years Departmental Special Assistance Fund offered by University Grants Commission. The department has purchased from this fund number of valuable equipments for higher researches.

Lastly the Editor likes to mention that this department will celebrate its Platinum Jubilee in humble way by February 1997. A National Seminar will be organised by the department on this occasion and some eminent anthropologists will come to "Meet the Students" programme.

Syamalkanti Sengupta

Remote Sensing and Its Scope in Anthropology

SUBHRA BHATTACHARYYA, ASHIS BHATTACHARYYA AND ASOK K. GHOSH

Abstract : Instead of making exploration only through fieldwork, the application of remote sensing methodology is more appropriate, specially in terms of time and cost. In recent times, RS technique has turned to be the most effective and efficient tool due to its synoptic viewing of a large parts of the surface of the earth in detail, repetitive coverage of the same area and multi-spectral nature. This method has already been utilised in carrying out studies in the field of geology, geomorphology, ground water, forestry, urban sprawls, land use etc. In the area of anthropology with the focus on stone age cultures, endeavours have already been made. In the present disquisition, the historical review has been made both on RS and its application in the field of anthropology, including archaeology. The authors have also made suggestions for further scope of the work with the corroboration of apt examples. The authors' view is to incorporate RS in the post-graduate syllabus of archaeology and anthropology, thereby extensive researches in the forementioned disciplines can be projected. In this connection, NRSA has an important role to play, specially for imparting advanced training.

Key words : Aerial photography - Remote sensing (RS) - Imagery - Geomorphological features - Human activities - Land use - Analogy.

INTRODUCTION

Remote sensing (RS) is the technique of deriving information about objects on the surface of the earth without physically coming in contact with them. This view existed since 1960 when the term RS was first coined. But currently RS is more commonly used to denote identification of earth features by detecting electromagnetic radiation which is reflected/emitted by the earth's surface.

The concept of RS, perhaps in nabulous form started with the invention of photography in mid-nineteenth century and was used in making topographic maps. It further developed with the successive invention of the gelatin photosensitive emulsion in 1871. The latter method allowed delayed development of the latent image. To begin with, balloons were used as aerial platforms with shifting provision for cameras to observe earth's surface.

BACKGROUND

Through time, gradual development set in, both with the system and mechanics. In 1903, the platform for placing the camera was shifted to aircraft. This brought out a good deal of convenience with regard to location in space and distance in height of the camera from the surface of the earth, enabling identification of the objects with adequate perfection and also better precision. In furtherance, significant development ushered with the invention of multilayered colour film and infra-red (IR) sensitive emulsions. The accretion was triggered with the launching of earth orbiting satellites in 1957, compounding up with the application of electronic computer (Fisher et. al., 1975).

RS of earth's feature can be done either by aerial photography or by satellite imaging. Aerial photographs are taken by cameras/sensors[1] fitted on a platform situated at a considerable height from the earth's surface. The airborne platforms may be balloons (Guy, 1932), kites (Bascom, 1941), cranes or aircrafts. Balloons floating upto an altitude of 49 kms were developed in India by 1972 for land survey (studying earth's surface) and the atmosphere. But the use of the same is restricted by meteorological factors, especially direction and velocity of wind. Balloons used in aerial surveys are of two types, free and captive or tethered. Free balloons are designed according to the type of desired trajectory. They may hover over a particular area or may return to the starting point after covering a distance. Tethered balloons are connected to the earth station by means of wires having high tensile strength and flexibility and have been successfully used to support aerial cameras for mapping different types of sites, including anthropological and/or archaeological sites (Scollar, *et. al.* 1990; Huseonica, 1993; Guy, 1993).

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[1] Sensors are devices used for making observations. These consist of complex mechanisms. Usually sophisticated lenses with filter coatings are set, to focus the area observed into a plane in which detectors are placed. Sensors are provided with imaging facilities which display a picture or to non-imaging versions.

Aircrafts used for RS are specially designed to carry sensors, such as multispectral scanners, magnetometers and synthetic aperature radars, mounted individually or in different combinations. The entire system facilitates aerial surveys from about 60 m (300') to 900 m (30,000') altitude. Since altitude of platform can be altered, images on different resolutions and scales (from 1 : 5000 to 1 : 250,000) can be obtained.

Imagery obtained from sensors are fitted to the satellites. These satellites are generally of two types, viz. geostationary and near earth polar orbiting. Geostationary satelllites are stationary with respect to the earth (i.e. moving in equatorial orbits) and fixed at an altitude of about 36,000 kms from the earth's surface. Due to their placement at a large distance from earth, high resolution imaging is difficult and are extensively used for meteorological applications. These satellites complete one orbit in 24 hours. Near earth polar orbiting satellites are fixed at a much lower altitude between 700 and 1600 kms. Because of their lower altitude, imagery with higher resolution can be obtained. Most useful orbit for RS is the circular, near polar and sun synchronous. In such synchronous orbit[2], all points at a given latitude have the same local mean solar times. Therefore, similar levels of illumination are received. The ground trace of the satellite can be made to recur over an area at intervals of fixed number of days; thus repetitive observations of the area is ensured.

SATELLITES LAUNCHED FOR RS APPLICATIONS

A very brief account on the application of RS has been outlined here. This chrono-historical discussion points to variations among different satellites. At the same time, the developmental stages are found to be conspicuous.

1. *LANDSAT-I* (*Land satellite*)— This is a RS satellite, the technology of which is applied to natural resources survey of land. It is a sun synchronous satellite, launched by USA in July 1972. The altitude of this satellite was 913 km with 18-days repetitive cycle. The ground coverage of each scene (185 km x 185 km) provided a synoptic view, covering a very large area of the earth's surface. Similar satellites, Landsat-2 and 3, were launched on January 22, 1975 and

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[2] Sun synchronous orbit indicates the plane of the orbit which maintains a fixed orientation with respect to the sun.

March 5, 1978 respectively. These had gound resolution of 80 ms while imaging through MSS[3]. This ground resolution of 80 m means that the sensors on broad satellite can record all the objects together in a ground cell having dimension 80m x 80 m as a single reflection on the image, known as picture element (Pixel). All these three satellites functioned from about 5-8 years. Later, in continuation of the programme, Landsat-4 and 5 were launched respectively on July 16, 1982 and March 1, 1984. These satellites had the ground resolution of 30 ms, with provision for revisit on every sixteenth day, orbiting at an altitude of 705 km and ground coverage was similar to Landsat-1.

2. *SPOT* (*Systeme Probatoire d' observation de la Terre, i.e. system to probe and observe earth*)— The French satellite was launched in February 1986 with spatial resolution of 10 m in single visible band and 20 m in multispectral bands, capability of displaying stereo images. It is in the orbit, placed at an altitude of 833 kms with a revisit cycle of 26 days. Spot-2 was also launched in January, 1990.

3. *MOS* (*Marine Observation Satellite*) *and JERS* (*Japanese Earth Resources Satellite*)— Both were launched from Japan. Data from these are not recorded in India.

4. *ERS* (*European Remote Sensing Satellite*)— European Space Agency launched the microwave satellite on July 17, 1991. This is capable of taking measurments under cloudy conditions and during night.

5. Like few other countries, India also turned to be capable for application of this technology. Stage by stage the component worked, such as design, fabrication, launching and monitoring space satellite. Further data were analysed and interpreted for multiferious developmental programmes.

In this context, it is worthwhile to present a synoptic layout of the programme already conducted by Department of Space. The first Indian experimental satellite "Aryabhatta" was launched successfully in April, 1975, with the help of USSR for launching, in an orbit 600 km above the surface of the earth, with an inclination of 80^{0} to the polar axis. It functioned for almost 6 years.

Next came the Bhaskara series, one after another. Bhaskara-I and II were launched with the Soviet help on June 7, 1979 and November 20, 1981 respectively. It went on transmitting pictures of 341 x 341kms of the surface of earth and with a spatial resolution of about 1km., orbiting at a height of 525 km. It worked till 1984.

The sensor technology acquired through Bhaskara-I and II, and the stabilisation technology learnt through APPLE space draft paved the way for the achievement of IRS-IA, launched on March 17, 1988. It was placed in an orbit of 904 km above the earth surface and weighed 975 kg. It carried two push broom type cameras (LISS-I and LISS-II; Linear Imaging Self Scanning sensors) with a ground resolution of 72.5 m for LISS-I and 36.25 m for LISS-II, having a swath covering 148 km of earth's surface for LISS-I and 74 km for LISS-II. Its consequent revisit is on every 22nd days.

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[3] Imaging through Multispectral sanning (MSS) refers to viewing a given area in several narrow spectral bands to obtain better identification/classification of objects.

IRS-IB was launched in March, 1991 to support IRS-IA and carried identical load. The combined operation of the two satellites provided a revisit in the same area after every 10 days or on 11th days.

The Polar Satellite Launch Vehicle (PSLVD-2) was launched on 15th October, 1994 and placed in orbit IRS-P2 at 817 km with a revisit capability once in 24 days. It marked a great achievement for India as it provided a ground resolution of 33 meters. PSLVD-3 was launched on 5th March, 1996, placing IRS-P3 in orbit.

IRS-IC launched on 28th December, 1995 has a very high resolution, having three sensors, PAN[4]. LISS-III[5] and WIFS[6]. It is put in a polar, sun-synchronous orbit at an altitude of 817 kms with revisits on every 24th day. It is a pride for India that IRS- IC is the best satellite in the world today for its high resolution. USA is also acquiring data from IRS in their earth station at Norman, Oklahoma. Presently India has four resources satellites in the orbit.

The advent of satellites is allowing acquisition of information about the earth and the prevailing environment. This is conducted primarily through measurements, made in different spectral regions as a result of interactions between the targets and electromagnetic radiation (EMR). The reflectance (spectral)[7]/ emittance of any object at different wavelengths follows a pattern, which is characteristic of the object, known as spectral signature. Identification of objects is done by interpretation (Sabins, 1986) of these spectral signature. EMR spans a large spectrum of wavelengths from very short wave gamma rays (10^{-10}m) to long radiowaves (10^{6} m).

Different spectral ranges in which data is recorded by various satellite programmes and their remote sensing applications are given in table 1.

Table 1

Band	Spectrum	Spectral range (in microns)	Principal application
1	Visible (blue)	0.45 – 0.52	Coastal water mapping soil/ vegetation deciduous and coniferous differentiation.
2	Visible (green)	0.52 – 0.59	Green reflectance from healthy vegetation.
3	Visible (red)	0.63 – 0.69	Chlorophyll absorption for plant species differentiation.
4	NIR	0.76 – 0.90	Biomass surveys and water bodies delineation.

[4] Panchromatic camera (PAN) is designed to provide data with a spatial resolution of 5.8 m in a single entire visible spectral band.

[5] LISS-III sensor provides multispectral data collected in four bands of visible (green and red band) NIR SWIR having 23.5 m spatial resolution for visible and NIR and 20.5 fir SWIR.

[6] Wide field sensor (WIFS) collects data in two spectral bands (visible red NIR) with spatial resolution of 188 m.

[7] In IRS-IA & IB, data are recorded in first four bands of table 1, whereas IRS-IC records in bands 2, 3, 4 and 5. Thematic Mapper (TM) sensors of Landsat-5 records data in all the seven bands where band 7 is introduced later, which is known as a geological band, as the use of the data recorded in this band, is exclusively for geological studies. SPOT satellite records data in three bands, i.e. from band-2 to band 4, which are designated as bands 1, 2 and 3 respectively.

Spectral reflectance is the ratio of reflected energy to incident radiation as a function of wavelength.

Table 1: (*Contd.*)

Band	Spectrum	Spectral range (in microns)	Principal application
5.	SWIR	1.58 – 1.75	Snow/cloud differentiation, vegetation moisture measurement.
6.	THIR	10.4 – 12.5	Plant heat stress measurements and general thermal mapping.
7.	SWIR	2.08 – 12.35	Hydrothermal mapping.

SW – Short wave; IR – Infra red; N – Near; TH – Thermal.

COLOUR DIFFERENTIATION AS MARKER

Many surface materials of the earth have different spectral reflectance characteristics when illuminated by different regions of the electromagnetic spectrum. For example, vegetation may reflect only 10-15% in the green portion of the spectrum and as much as 40-60% in the year infra red parts, whereas chlorophyll absorbs maximum red wavelength of 0.45 micron. Stress in vegetation, due to disease, insect infestation and nutrient deficiency can also affect the reflectance characteristics. A healthy plant gives less reflectance in the red region and high reflectance in near infra-red, as compared to moderately and severely light affected plant. This type of stress is easily noticeable in the near infra-red (0.7 to 0.9 micron) imagery even in early stage of disease. Hence, colour infra-red image is often preferred for monitoring vegetation stress. Similarly, one can differentiate between wet soil and dry soil, coarse and fine soil, various rock types, clear and turbid water, shallow and deep water etc.

The standard film type for aerial photography is the panchromatic black and white film which has a spectral sensitivity ranging from 0.35 to 0.70 micron. A minus-blue (yellow) filter is normally used to absorb the atmospheric haze found in the blue portion of the spectrum. Another film type readily available for use is the infra-red black and white film. (0.6-0.94 micron). A red filter is normally used to eliminate atmospheric haze. Water bodies are highly absorptive in infra-red band. Therefore, this film is ideal for rural land-use and land cover mapping (Chevellier et. al., 1970).

In RS, nowadays colour films are used. A true colour film consists of three layers of emulsion, each is sensitive to one of the three primary colours. Because the green and red layers are sensitive to blue light, a yellow filter is inserted between them to eliminate the undesirable blue light. After exposure, each layer is developed in the three complementary colours of yellow, magenta and cyan, corresponding to colour sensitivity of each layer. When these are combined, as net effect, the original colour is visualized. A false colour composite (FCC) is also generated by shifting the colours. Instead of being sensitized to blue, green and red, the emulsions are made to sensitize to green, red and infra-red respectively. A minus blue (yellow filter) is used to cut out the blue light. Colour infra-red film reacts most strongly with vegetation which is exhibited in varying shades of red, depending on the amount of reflectance from the leaves. For example, forest plantation appears light red to red in tone, it is of bright red in tone in case of mangrove, evergreen forests show dark red in tone etc.

The other characteristic features appear with tonal difference in the FCC imagery are:

Salt affected land — white to light blue,
Waterlogged lands — light to dark blue tone with patches of red if vegetation occurs,
Sandy area — bright white to yellow with bluish to reddish tone,
Barren rocky area — greenish blue to yellow to brownish tone with irregular and discontinuous shapes,
River/stream — light to dark blue depending on the depth of water,
Clear deep water — appears black,
Shifting cultivation areas — light yellow to brown in tone,
Snow covered / glacial areas — bright white tone.

PROCEDURE FOR ANALYSIS AND INTERPRETATION OF DATA

The analysis of remote sensing data is done by interpretaion of the imagery, either visually or with the help of computers. Necessary discussion in exhaustive form has been carried out by Sabins (1986). For identification of the objects in the area under study, a number of photo/image elements, such as tone/colour, texture, pattern, shape, shadow, size and association are taken into consideration.

In computer-aid approach, the data are transcribed into digital form. On the basis of the level of radiance, geometric/radiometric distortions are corrected to extract the feature. This method may be taken as efficient means for arriving at consistent results for large areas. In fact, the method of analysis is improving and thereby the results are of wide spectrum in nature. In course of continuous explorations and tests, RS is turning to be an efficient and effective tool for the purpose of making solution of various problems on earth's surface, both of present and past.

SPECTRUM OF APPLICATIONS

RS methods have been applied to various disciplines[8], such as geography, geology (Rowan and Lathran, 1980; Bhattacharyya, 1992), botany, zoology, civil engineering, forestry, meteorology, agriculture, oceanography and currently archaeology and anthropology. It is observed that RS is practically making new invasions to different disciplines. The application of RS methodology is yielding new data and with the interpretation of the same, information are multiplying. As the cumulative result, knowledge is making advancement in the field of RS using high resolution IRS-IC data.

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[8] Application of RS method in various fields has been discussed in concised form by Siegal and Gillespie (1980). The other aspect, viz. applied RS, has given rise to a relatively new opening (Lo, 1986).

In India, National Remote Sensing Agency (NRSA), Hyderabad, carries out a number of applied projects to develop methodologies and to operationalize RS. Some of the major areas are : water resource management (Salomonson and Range, 1990), land-use/land cover mapping, ground water studies (Bhattacharyya and Reddy, 1991), mineral exploration, agriculture and soils, forestry, oceanography, identification and mapping of potential sites for fishing near Indian coasts, waste land and wet land mapping, and many others. From such a wide range of applications, in the present disquisition, the focal point has been shifted to anthropology, the main aim of this presentation. Otherwise, without such restriction, the purpose may be defeated.

APPLIED SCOPE OF RS IN ANTHROPOLOGY

In the field of anthropology, RS techniques have not been utilized much even though there is a great scope for the same. It is conceded that anthropological details may not be properly extracted/ pooled with the direct use of this technique. However, studies on extensive vis-a-vis intensive forms may solve many of such problems, especially related to spatial coverage, exposed surface layout pattern etc.

Contemporary archaeology is concerned with the increasing mastery of nature by man. Smaller hunting and gathering economics left few visible traces in the environment. In some remote arid parts of the world, it is quite easy to see the remains left by human activity which sometimes survive for very long period inside or on the surface of the ground. But in heavily occupied regions, most surface traces of the past have been obliterated. Traces remain in the ground just below the surface and these are usually studied through archaeological excavations. Since excavations is a tool of last resort, techniques for non-destructive investigation of sites have been developed during the last half of this century. Excavation also results in the destruction of the site and is non-repeatable experiment. Therefore, remote sensing data may be used to identify the archaeological/ remote sites, yet to be discovered.

IN SEARCH OF SITES

Ideas about prevailing archaeological sites, as anthropological or palaeoanthropological sites, i.e. location, is known to an archaeologist. Therefore, viewing archaeological sites in a broad regional context and the synoptic coverage/overview provided by satellite data is of great value. The techniques which are/may be used to discover archaeological site locations from satellite data are :

i) interpretation of soil marks,

ii) observation and interpretation of vegetation marks,

iii) delineation of anomalous landforms,

iv) interpretation of palaeochannels and palaeo mud-flats,

v) interpretation of coastal markings, strand lines, river mouth etc.

Another technique is to frame a strategy on what all known archaeological sites have in common. Then a map could be produced which shows other areas with the same characteristics.

These areas showing such characteristics should be inspected in order to locate new archaeological sites.

RS technology have proved to be a time-saving, low-cost way of prioritizing and pinpointing sites for excavation. Fieldwork is necessary to verify RS data and to map accurately the sites throughout the region.

Site location can be specially made on aerial photography by archaeologists and later transferred to existing maps with locational accuracy. These locations supplemented by ground truth can be used to plot new sites in unsurveyed areas. Preliminary tracing of site elements and configurations on imagery are less time taking than ground surveys. Archaeological sites are usually located near water bodies, may not be near the present river course but along the palaeochannels. With moisture associated vegetation fill generally give clues to the existence of palaeochannels and this can be easily traced in the imagery.

Satellite imagery give an overview, at a glance, of relatively larger tracts of our planet. Certain types of structure, that cannot be readily detected on the ground are possible to see in satellite imagery. This idea is extensively used by archaeologists in many parts of the world but unfortunately in India this method is not put into use. Often satellite imagery clearly reveal structures that have become unrecognizable over the centuries. Even ancient tracks can easily be detected on the imagery.

Satellite RS plays an important role in monitoring the changes in urban growth and development. With the aid of such method and available data for the last 5 years or 10 years or even more, for a particular study area it can easily be possible to find out the pattern or trend in urban growth and development, changes in the spatial urban land use patterns, loss of ground water, etc brought about by rapid urbanisation and industralization. Such information on urban sprawl, urban land use etc can help social anthropologists working on urban society. Remote sensing data are also useful to marine archaeologists, as underwater features are clearly visible in satellite imagery.

RS AND ANTHROPOLOGY — SOME APPLIED ASPECTS

In the present discussion, instead of considering anthropology in its various components, the total anthropology has been primarily focussed. In the relevant context, the component, in terms of subdivision of anthropology has been indicated. On the basis of the works so far carried out in broader aspects of anthropology, it appears that RS has made a number of contributions from the methodological point of view. Most of the works primarily cover the human groups of a specific region with their relationships on land. There is practically no work, so far, in biological anthropology with RS. On the other hand, the prospect of RS application looks promising in the dimension of archaeology, specially with its inclusion within the broader canvas. The discussions forwarded herein have two parts :

1. First, an attempt to review the existing works of special significance.
2. The second part, presented later, costitutes the future works to be carried out on priority basis.

It is worthwhile to mention that RS is a developed methodology, with its genesis laid in aerial photography. The latter has a number of conveniences. In a way, aerial photography is also considered as RS, but the camera is not placed on a satellite but on a balloon or an aircraft. The aerial photography may be operated within the manageable limit. With the application of this method, aerial view of relatively smaller area under consideration is projected. Simultaneously, the inconveniences can seldom be ruled out. These comprise the limiting constraint of the aerial coverage and the materials of relatively smaller dimensions are not always clear, thereby proper identification of the same can seldom be made. Compared to aerial photography, satellite imagery is a mega project. The imagery of the area are taken from the satellite in a continuous manner. The covered area is of immense dimension. One of the prime uses of the imagery is related to identification of water bodies, plants, forest cover, type and texture of soil etc. Such identifications are simply made by the colour distinction shown in the imagery. Because of the long distance between the crust of the earth and the satellite, micro details of the area are not shown in the imagery. The authors hold the view that explanation and identification will turn better if both the aerial photographs and imagery are taken together for the purpose of scanning. Unless either the imagery or aerial photographs are specially analysed, simply the term RS may not turn to be both useful and meaningful. On the basis of the review of literature on RS, it is indicated that aerial photographs as RS are mostly implemented.

Aerial photography as a tool for research in archaeology and anthropology came into vogue during 1920s, especially in Europe and America. In India, the RS devices were applied as early as 1972, since then satellite data have extensively been used. However, even after when satellite imagery were taken and the data were available, the aerial photographs were not discarded. In fact, both the systems were found to be continued simultaneously. The choice of aerial photographs and satellite imagery largely depends on their availability and the specific purpose or objective.

Rowe (1953) in his paper on "Technical aids in anthropology, a historical survey", made a special mention on "aerial reconnaissance and photographs". The forementioned paper includes a sweep coverage of the historical events which took place in aerial photography in the domain of anthropology, including archaeology. It was O. G. S. Crawford who made observations on aerial photographs of archaeological sites in England, as far back as in 1920s (Crawford, 1928). In the same decade aerial photographs of American sites were taken by Wells and Mackinley in 1921-22 with Smithsonian Institution. Afterwards, in the next decade, aerial survey of prehistoric canal in Arizona was undertaken by Judd (1931). The method was further extended in the dimension of space and Peruvian archaeology was represented through aerial photographs (Shippee, 1932). The follow up action was made in other areas as in Switzerland (Sauter, 1947), Australia and Malaya (Williams-Hunt, 1948) and in Thailand (Williams-Hunt, 1950). The objects comprise both archaeology and geomorphology, namely earthworks and shore-line sites. In the meantime, with the application of same methodology, endeavours were made for understanding prehistoric agriculture in England (Payne, 1948).

Gradually, the area of interest was shifted to ethnography. With a view to finding out the impression of landscape (Gillin, 1947) in land use pattern, researches were also carried out with ethnographic bias, covering the pan-World context in representative manner (Sisam, 1947).

Both American and French ethnographers also used the same technology. Harp (1966) made a predication in ethnolography with application of RS. It was apprehended to study the cultural systems with ecological integration. The importance of aerial reconnaisance was aptly pointed out with the comment "it is very desirable to go on the flight to see the terrain with his own eyes" (Rowe, 1953 : 909). Bevan et al (1975) has presented a synoptic review on RS, with special reference to its application in the fields of archaeology, anthropology and cultural resources management. Afterwards, further modifications and progress have been made.

Data pooled from aerial photographs are of great help in making demographic profiles and relative quantitative vis-a-vis qualitative assessment. Scorr's (1974a, 1974b) results on the data culled by aerial survey were used to deduce relationship between ecology and settlement pattern. Aerial photography was developed which brought forth RS, and ushered a new era in terms of application of RS, both as a tool and methodology (Vogt, 1974). As a result, locale microgeography was endeavoured to work out (Collier, 1974). It is also to be noted that application of RS in diverse anthropological research projects brought out significant development.

In brief form, anthropology is the study of man, of different chronological periods. Palaeoanthropology, one of its major subdisciplines, is concerned with the study of early man. Even then, various perspectives of modern man can not always be set aside from the fold of palaeoanthropology. These information are useful for drawing appropriate analogies. As a result, the temporal dimension of palaeoanthropological works covers a very wide time spectrum, with a duration of more than 1 m.y. B.P. With regard to man, irrespective of divisions of any kind, there are a number of attributes which are closely linked. These components include space or area of living, environment with its effect on surface geology or geomorphology, the biological characters and cultural entities. By now, a large quantum of anthropological information, including those of palaeoanthropological studies, are at our disposal. In the area where such works have been carried out, RS imagery are to be considered and independently interpreted (Wynn, 1986). Afterwards, the results of less known or even unknown episodes are to be matched with the known information and interpretation of reality. It is apprehended that the above noted methodology may be formulated and consequently modified for the purpose of conducting researches in the area of anthropology, with the application RS technique. The present hypothesis has been attempted to explain with apt examples. The prime character of convenience on this methodology is laid on the comparison between known and unknown facts and figures. Again, for the inclusion of a number of locales with the same problem, the method may be fruitful and at the same time, generalised in nature.

EXAMPLES AS TEST CASES

With a view to wiping out the misconception, if any, it appears to be essential to point out that RS studies are carried out both on aerial photographs and satellite imagery. Between the two forms, a number of similarities are met with. At the same time, the distinctions between the two cases, can not be ignored. The difference between the forenoted two methods are due to discretely different techniques. For such technical disparities, both conveniences and constraints are to be taken into cognigence. For example, relatively small objects, of course of a standard dimension are visible in aerial photograph and that is not observed in case of satellite imagery. Again, the area of coverage on aerial photographs is much smaller, compared to satellite imagery. In case of the latter, the texture and tone of the objects on imagery are conspicuous and dissertate.

It is to be clearly stated that the primary objectives of RS is to collect the information of the earth's surface, expressed in photography or imagery. This also includes other objects which are placed on the surface. But for the purpose of identification of these objects, the size is an important criteria. A number of small plants or a big tree is not recognisable in RS system. Naturally RS is hardly of any use with human beings and the materials traits of culture placed in isolation. However, human activities on the surface of the earth may be well depicted with the application of RS system. The cluster of huts giving rise to villages, are observed. At the same time nature of land surface and its varietal utilisation can be worked out. The total information, if properly analysed, will give rise to a number of results related to shape, size and area of the villages, their distribution pattern, territorial concept, landuse, natural or artificial irrigation systems etc. The total work is expected to yield the land-man relationships with great precision. This illustration may be extended in furtherance. If RS depictions are available throughout a year with intervals, the types of crops in different seasons and the aerial coverage can be calculated. Without additional fieldwords this data may produce brilliant results. If the data pulled from RS are further corroborated with actual fieldwork, both the depth and magnitude of the work will be immensely rich. In the same fold, additional information may be supplied with.

The other information is of an integrated work with the involvement of anthropology, archaeology (better be said as palaeoanthropology), and geomorphology. In various parts of the world, there are stone age sites. Such sites in the Old World are markedly different from the New World counterparts. Herein, the context is primarily concerned with the Old World, keeping the primary focus on South Asia or India. The earliest form of the members of the genus *Homo* used to live during the Pleistocene epoch. The group is known as *Homo erectus* and they were the bearers of Lower Palaeolithic culture. Within a span of about 1million years, large number of fossil finds of the same genus of different species emerged almost one after another, during the rest part of the Pleistocene epoch. The succeeding cultures, associated with those species of genus *Homo*, are known as Lower Palaeolithic and Upper Palaeolithic cultures. By now, within a span of more than 100 years, large number of different stages of Palaeolithic culture have been discovered, yielding surfeit of tools made on different types of rocks such as quartzite, quartz and different varieties of colloidal silica as jasper, cherty quartz, porcelanite, agate etc.

The distribution of some of the representative sites, belonging to different stages of Palaeolithic culture, are to be plotted on the toposheet. This transcription indicates the location of the sites with respect to the local geomorphological features. This area, with specific limits is to be photographed and intensive scanning is to be carried out with a view to finding out any marker for identification. The nearby region without Palaeolithic site is to be taken for the purpose of comparison. Besides, the natural agencies and the human activities might have played a significant role in changing the surface geomorphology of the Palaeolithic sites. Such matters may be taken as clue for finding out other sites which have not yet been discovered. In this process, the field explorations for finding out the site may be minimised to a large extent. On the other hand, on the basis of RS data, systematic reconnaissance and thereby study with precision may be made in continuity. RS reconnaisance may also be used to differentiate, Lower, Middle and Upper Palaeolithic sites. This appears to be obvious because the cultural milieu of the forementioned three sub-periods was different from one another. The total cultural traits and contours may be considered as a responsive result to the differential changes in the geomorphological settings. Similar, works if carried out on Palaeolithic and Neolithic sites, the rate of probability for distinguishing two sets of sites will be more. Afterall, the life style and adaptive mechanism of Palaeolithic nomadic hunter-gatherers and Neolithic settled agriculturists were discretely different from each other.

IN CONCLUSION

RS is also useful for the purpose of understanding the relationship between stone age human settlement and the geomorphological features of the sites and so also the vicinity area which was utilised for the sustenance of livelihood. It is not unlikely that these results may give rise to the model building process with the aid of testing through superimposition of the information from the present day societies of hunter-gatherers on the prehistoric settlement.

It is suggested that RS is to be developed for anthropological researches and for appropriate application of RS methods, anthropolgists are to be properly trained. This is feasable if methods and techniques related to RS are included within the post-graduate syllabus of anthropology and archaeology in all the universities for students or researchers who wish to carry out works in anthropology and archaeology with the application of RS. Higher training facilities are to be rendered by National Remote Sensing Agency (NRSA), Hyderabad. NRSA already conducted a training programme in October 1995 on "RS in Archaeology and related disciplines" for the first time in the country, under the sponsorship of National Natural Resources Management System (NNRMS), attended by many university teachers, scholors and professionals in this field.

RS technique had made accelerated development and the trend is still found to be continued. Inspite of the fact, scholars in different fields, as anthropology, archaeology etc are not much aware of the same. There are instances which indicate workers in other fields, as mentioned above, do not have the least understanding of the necessity of application of RS technique. The situation does not appear to be dissimilar other way round. It is still an open question about the concepts of RS scientists in the fields of anthropology and archaeology. With a view to change this state of affairs, training-cum-workshop programmes are to be initiated for mutual help, cooperation and assistance from both sides. It is further expected that as a result of such programmes, a communication network may be established between the two groups of workers. In furtherance, receprocal dissemination of knowledge will bring about a kind of synthesis between RS and other disciplines, like anthropology and archaeology, in which RS technique will bring out new results. In terms of practibility, joint projects of limited dimension may be formulated for action oriented programmes. It is already the high time when proper planning is to be made and with accelerated progress, both of programmes and operations, the deficits may be compensated at the earliest.

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Folk Taxonomy : The Case of a Tribe

SYAMALKANTI SENGUPTA AND SOMA BANDYOPADHYAY

Abstract : The paper aims to decipher environmental perceptibility of a community residing near forest-hill area. Environment has been considered in three major scales-*perceptual environment, effective environment and total reality of environment.* Folk-taxonomy of *Daare* (plant) and *Jib* (animal) has been aimed at using several lexicographical techniques. The total study has been done within the premise of 'Ethnoscience' i.e. peoples' own point of view, wisdom and logic have been given priority importance. Peoples perception has been represented by using Inclusion-contrast phenomena and to make this representation more scientific, the authors have applied several conventional techniques like attribute reduction, configurational recoding, analysing short-term memory. The total taxonomy has been portrayed through different levels like *Unique beginner, Life-forms, Generics, Specifics* and *Varietal.* In some cases some Intermediate level or Covert category has also been shown. Analysing data in this regard it has been found that people are not so adept in perceiving the varietal level. This fact has been applied as a step for measuring perceptibility of the members of the community under study.

Key words : Ethnoscience, Folk-taxonomy, Inclusion-contrast, Attribute reduction, Configurational recoding, *Daare, Jib*

I

Levi Strauss argues that all the social productions are articulated within the network of a primary binary opposition : Nature and Culture.

The present discourse deals with nature and culture with the facts regarding folk taxonomy and environmental conceptualization of the Santal inhabitants of the village Dhatkidih and Digri, east Singbhum, Bihar. Dhatkidih is 4 km. south east and Digri is 8 km. north west to Galudih, a roadside station in Kharagpur-Jamshedpur railway tract in the vicinity of Ghatshila. Total population of the villages is 368 and 303 respectively. But in case of Digri village only 27 adult Santal souls were considered as the authors' informants. In Dhatkidih 15 individuals of age group 50 and above were used as informants.

In relation to work in east Singbhum area of Dhatkidih and Digri villages among the Santal, the authors wanted to understand the concept of environment by these people, with special reference to three scales viz. *perceptual environment, effective environment* and the *total reality of environment.* These are highly culturally significant. Levi Strauss thinks that these are included in human nature. All human being conceptualize environment culturally, eat culturally opposed to animals who do not. There is human nature to which cultural code, ways of structuring experience are to be reduced : ultimately the physical nature of the collective human mind itself (Tilley 1991 : 21-22).

The premises of environment bring the authors into the exposure of folk taxonomy through semantic domain. The subject matter is considered in this study as "Ethnoscience". The term refers to that study done from an ethnic groups' own point of view, logic, wisdom and those decisions and choices which are the result of immense vis-a-vis continuous experimentation.

In the course of learning from various categories of people (man-woman, cultivator-serviceman, literate-illiterate, forest goer-nongoer and so on), in the Santali dialect of the Santal, the authors were partially successful in conceiving the perception of the people in question, regarding classification of plants and animals. The taxonomy of the plant and animal is aimed at and the conventional lexicographical principles regarding folk taxonomy has been followed as far as practicable.

II

The perception of the natural distinctiveness of any particular plant or animal species, (recognised through cultural perception) furnishes access to whole range of species segregrates. The species is a collection of similarities in the morphological features and /or of similar functions. A terminologically distinguished array of objects is a segregate (Conklin 1954, 1962; Lounsbury 1956). Segregates are categories, but not all categories known or knowable to an individual are segregates by this definition. In case of the present study the authors have shown special interest on the hypothesis that the features of specific plants and animals tend to be perceived as a *gestalt*, or total *configurational unity*, rather than as a discrete list of properties. Peoples categorization of multiattribute objects (Hunn 1976) and limitations of shortterm memory has also been tried to overcome as far as possible. In this respect the authors have applied two major techniques prescribed by Bruner, Goodnow and Austin such as *attribute reduction* and *configurational recoding*. Attribute reduction consists of simply limiting the number of criterial attributes of features to a very small number–ignoring the rest of the attributes. Using this technique the term *Daare* has been found which people use to distinguish the array of the plant segregate. To distinguish a segregate people are in search of some morphological features, presence of which is the identity of the particular segregate, prescribed by the culture. According to attribute reduction *Daare* posseses only *Rehet* (root). *Dali* (stem), *Sakam* (leaf).

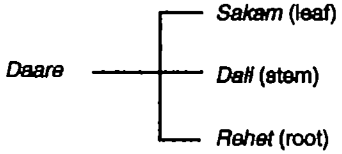

Fig. 1. Morphological features of the segregate *Daare* in attribute reduction.

Configurational recoding is the technique in which a number of features are 'chunked' together to form a single attribute. When the Santal use the term *Daare* they refer to a configuration of large number of attributes "recoded" and 'chunked' into single *Gestalt*. *Daare* may have *Rehet* (root), *Dali* (stem), *Sakam* (leaf), *Bedhaoa* (tendril), *Baha* (flower), *Phol* (fruit), *Janum* (spine) and so on. Thus *Daare* 'inherits' all the recoded attributes that make up this unitary conception which has the configurational or Gestalt property of "Daareness".

Another important factor is the multipurpose use of the term *Daare*. *Daare* is used to distinguish the total plant segregate as well as those plants having the capability of standing erect. The term *Naadi* is used to distinguish the creeper. So *Naadi* is not the member of *Daare* life-form but undoubtedly the member of the broad *Daare* segregate, though phonologically both are not the same. This incidence supports the fact that linguistic analysis of speech segments into grammatically functioning units are not sufficient for terminological analysis (Frake 1962).

According to the pattern of utilization or function to different plants and animals the Santal classify one segregate. This classification depends upon their experience through culture. Those culturally appropriate responses which are distinctive alternatives in the same kinds of situations or, in linguistic parlance, which occur in the same "environment"– can be defined as contrast. A series of terminologically constrasted segregates forms a *contrast set* (Frake 1962). Inclusion (implying separate levels of contrast) and contrast are two fundamentally different ways of folk categories within the same domain (conklin 1955). This inclusion and contrast can be represented in plant and animal domains as identified by the Santal inhabitants.

Contrast

INCLUSION

Daare	
Jomdaare (edible plant)	*Bakojomdaare* (non-edible plant)
Retdaare (medicinal plant)	*Gobojaldaare* (poisonous plant)

Fig . 2. Inclusion and contrast categories of *Daare.*

Fig. 2 represents the inclusion-contrast phenomena in the *Daare* (plant) segregate, *Jomdaare* (edible plant) and *Bakojomdaare* (non-edible plant), both are the members of the segregate *Daare*, i.e. the classification method is inclusion; where regarding edibility they are highly contrasting among themselves. Same is the case with *Retdaare* (medicinal plant) and *Gobojaldaare* (poisonous plant). This kind of folk-classification is also reflected in the identification of different plants depending on their structural differences or presence and/or absence of the common (Fig. 3) parts.

Contrast

INCLUSION

Daare	
Bahadaare (flowering plant)	*Banu-onah* *Bahadaare* (non-flowering plant)

Fig. 3. Structural difference of *Daare* in Inclusion-contrast phenomena.

This kind of inclusion-contrast modes are also applied while people classify plants according to their habitat and the nature of domestication.

Contrast

INCLUSION

<table>
<tr><td colspan="4">Daare</td></tr>
<tr><td colspan="2">Rohoy-daare
(domesticated plant)</td><td colspan="2">Ayejteke-daare
(wild plant)</td></tr>
<tr><td>Tnar
(terrestrial)</td><td>Da-bhitire
(sub terranean)</td><td>Tnar
(terrestrial)</td><td>Da-bhitire
(subterranean)</td></tr>
</table>

Fig. 4. Inclusion-contrast mode in habitat-domestication nature.

Plants are distinguished by using the term *Rohoy* meaning domesticated and *Ayejteke* meaning wild ones. These two are included within the broad *Daare* segregate. Again according to habitat both *Rohoy* and *Ayejteke* types include *Tnar* (terrestrial) and *Da-bhitire* (subterranean) which are contrasting among themselves (Fig. 4).

III

These features are also present in animal domain. The total animal domain is devoid of *Rehet* (root), *Sakam* (leaf) and *Dali* (stem). All animals are *Jibitmenayah* (living). They are classified under *Jib* (animal) segregate. *Janwar* includes some contrasting "unitary lexemes" (no segments of which may designate categories which are identical with, or superordinate to, those designated by the forms in question), regarding their food-habit *vis-a-vis* edibility, (Fig. 5).

Contrast

INCLUSION

<table>
<tr><td colspan="2">J i b</td></tr>
<tr><td colspan="2">Janwar (quadruped)</td></tr>
<tr><td>Jantu
(non-edible carnivorous quadruped)</td><td>Jil
(edible herbivorous quadruped)</td></tr>
</table>

Fig. 5. Inclusion-contrast net work of *Jib*.

Similarly *Chede* (bird) and *Tiju* (insect without wing) are also classified in this inclusion-contrast network by the native people. (Fig. 6).

Contrast

INCLUSION

<table>
<tr><td colspan="4">J i b</td></tr>
<tr><td colspan="4">Chede (bird)</td></tr>
<tr><td colspan="2">Rohoy (domesticated)</td><td colspan="2">Ayejteke (wild)</td></tr>
<tr><td>Dahakanah
(non-flying)</td><td>Uddakkanah
(flying)</td><td>Dahakanah
(non-flying)</td><td>Uddakkanah
(flying)</td></tr>
</table>

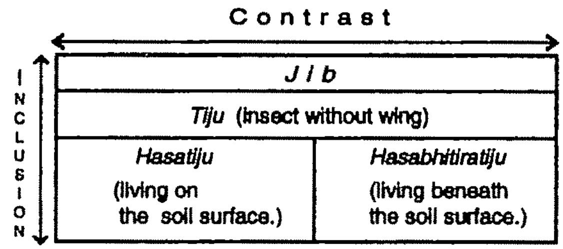
Contrast
INCLUSION
J I b
Tiju (insect without wing)
Hasatiju
(living on the soil surface.)
Hasabhitiratiju
(living beneath the soil surface.)

Fig.6. Inclusion-contrast phenomena among *Chede* and *Tiju*.

Methodological notions of contrast and inclusion have enabled the authors to discern some sturctures in this domain of cognitive choices. Categorization, in essence, is a device for treating new experiences as though it were equivalent to something already familiar (Brown 1958; Bruner 1957; Sapir 1949).

Ideally the criterial attributes which generate a contrast-set fall along a limited number of dimensions of contrast, each with two or more contrasting values or "components". Each segregate can be defined as a distinctive bundle of components (Frake 1962).

The Santal of Dhatkidih and Digri of east Singbhum, Bihar have beginner –a contrast set of five life– forms of plant, which together frame the total plant segregate.

Contrast Set	Dimensions of contrast : "Stem habit"	
Life-forms	Woodiness	Rigidity
Daare (erect plant)	W	R
Budhoe (bush)	$\overline{W}$	R
Ghaas (grass)	—	$\overline{R}$
Naadi (creeper)	$\overline{\overline{W}}$	$\overline{\overline{R}}$
Dah-bhitire daare (aquatic)	—	—

$W > \overline{W} > \overline{\overline{W}}$, $R > \overline{R} > \overline{\overline{R}}$

Fig. 7. Defining attributes of the Contrast-set of 'stem-habit' in the Santal plant taxonomy.

The Figure 7 represents the five-member contrast set which can be generated by binary contrast along two dimensions pertaining to habit of stem growth *vis-a-vis* woodiness and rigidity. These dimensions of identifying and classifying the *Daare* (plant) segregate are highly culturally significant and help the people to eleminate a particular life-form, from the other though included within a particular segregate;

While dealing with the life-forms of *Daare* (plant) segregate the authors have faced another important feature. The term *Dah-bhitire daare* is used to distinguish the aquatic plants. But the prefix *Dah-bhitire* means anything submerged in the *Dah* (water). In this regard *Dah-bhitire daare* is an unlabelled intermediate category lacking definite identifying term. So this can be included within the "covert categories" (D' Andrade 1962; Berlin, Breedlove and Raven 1968).

One of the major objectives of the authors is to order ethnographic observation with special emphasis on how people organize their experience conceptually so that it can be transmitted as knowledge from earlier generation to recent generation.

In course of close examination, made up of distinctive contrasts, in terms of actual minimal existent differences, a semantically verifiable solution is reached. In the plant domain of the Santal folk taxonomy, eight categories of plant have been observed to depend on the regular intersection of six components comprising three oppositions :-

1. Minimal existence : Non-minimal existence ($M : \overline{M}$)
2. Inclusion of body-parts : Exclusion of body-parts ($B : \overline{B}$)
3. Inclusion of edibility : Exclusion of edibility ($E : \overline{E}$)

    a) *Bakojomdaare* (BJD) $\overline{M}\ \overline{B}\ \overline{E}$
    (non-edible plant)

    b) *Jomdaare* (JD) $\overline{M}\ B\ E$
    (edible plant)

    c) *Rohoy* (Rh) $\overline{M}\ \overline{B}\ E$
    (domesticated plant)

    d) *Ayejteke* (Ak) $M\ \overline{B}\ E$
    (wild plant).

    e) *Bahadaare* (BD) $M\ B\ \overline{E}$
    (flowering plant)

    f) *Banuonah bahadaare* (BOD) $M\ \overline{B}\ \overline{E}$
    (non-flowering plant)

    g) *Gobojakdaare* (GD) $M\ \overline{B}\ \overline{E}$
    (poisonous plant)

    h) *Janumdaare* (JAD) $M\ B\ E$
    (spinal plant).

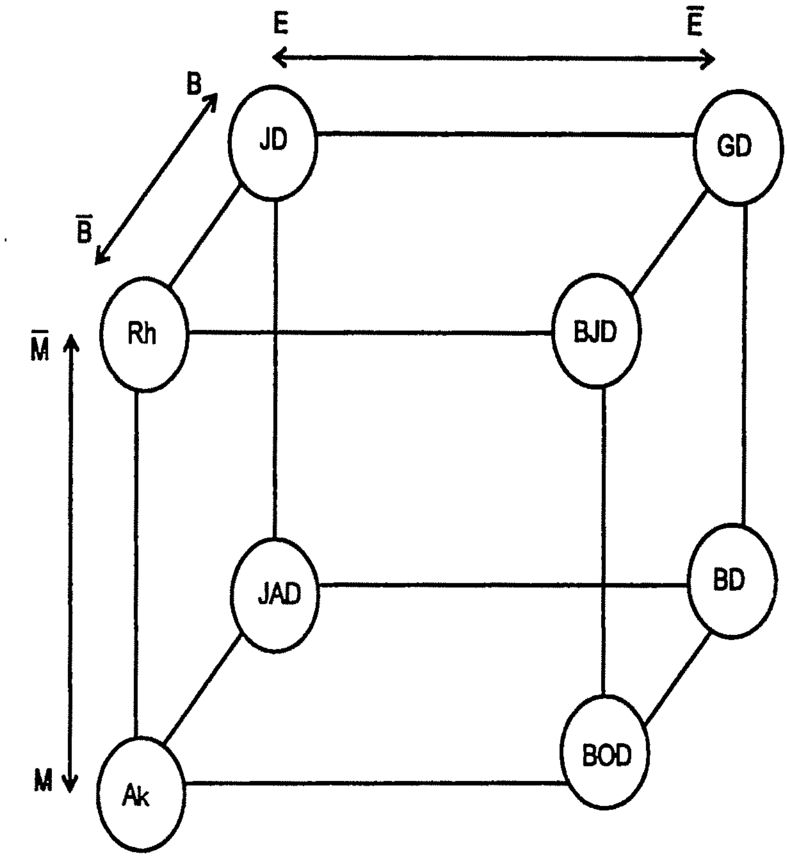

Fig. 8. Paradigmatic structure of the Santal plant taxonomy of regular intersection.

This relation can be represented in diagrammatic form (Fig. 8). The basic semantic structure of this lexical set portrays clear picture. This example also demonstrates an important characteristic of paradigmatic relations at one level, in a taxonomic subhierarchy, in contrast to non-commutative of class inclusion. In such a contrastive lexical set ordered by class intersection these categories seldom be arranged, in a taxonomic hierarchy.

In Figure 8, M represents minimal existence of a certain species which means the numerical occurence of the species is less than the members of non-minimal exitent group represented by $\overline{M}$. Edibility of a particular group is represented by E and non-edibility of that by $\overline{E}$. Species having some body-parts which are not found in *attribute reduction* (flower, spine etc.) are represented by B and those lacking the body-parts are represented by $\overline{B}$. This figure represents the relation between different functional groups within a single life-form (*Daare*). Vertical side of the cube represents the relation between minimal and non-minimal existent variety; horizontal side between edible and non-edible variety and the angular side between those having and lacking some body-parts. In all the six surfaces of the cube the same relation can be established.

Taxonomies use relations between kinds of things which have been recoded into "configurational attributes". One of the major findings of ethnobiology, stated by Berlin, Breedlove and Raven (1973-74), is that the folk taxonomies have a limited number of levels. Each level of a folk-taxonomy forms a rank, or level of grouping. The very top of a taxonomy is rank zero, consisting of a single term which refers to everything included in the taxonomy known as *unique beginner.*

Life form : The Santal have six life-form groupings. The life-form level indicates major perceptual discontinuities between kind of things. In the plant domain life-forms are usually based on "stem habit".

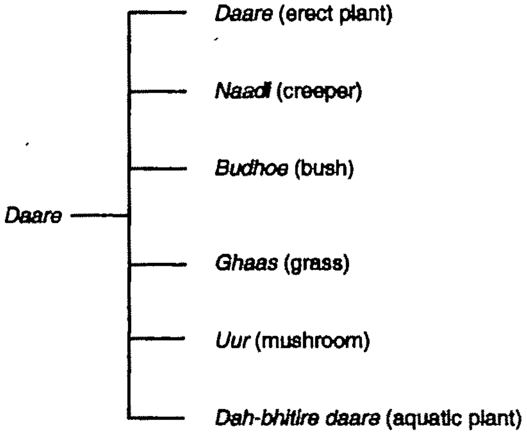

Fig. 9. Life forms identified within the *Daare* segregate.

Generics : Below the life-form grouping the Santal refer to *Generics.* They are the groupings which share numerous characteristic of forms and behaviour. They are 'natural kinds' of things.

The diagram presented in the figure 10 exhibits the ranks of a partial section of the Santal taxonomy for *Jib* in Santali dialect. The dotted lines indicate that more terms could be included in full taxonomy. The total animal domain is initially differentiated into six life-forms which are further classified according to conventional methodology of folk taxonomy. In the *Chede* life-form there are so many genera of which a few have been included in the figure. Some *Chede* species have been identified according to their mode of domestication which are further classified according to their colour variety.

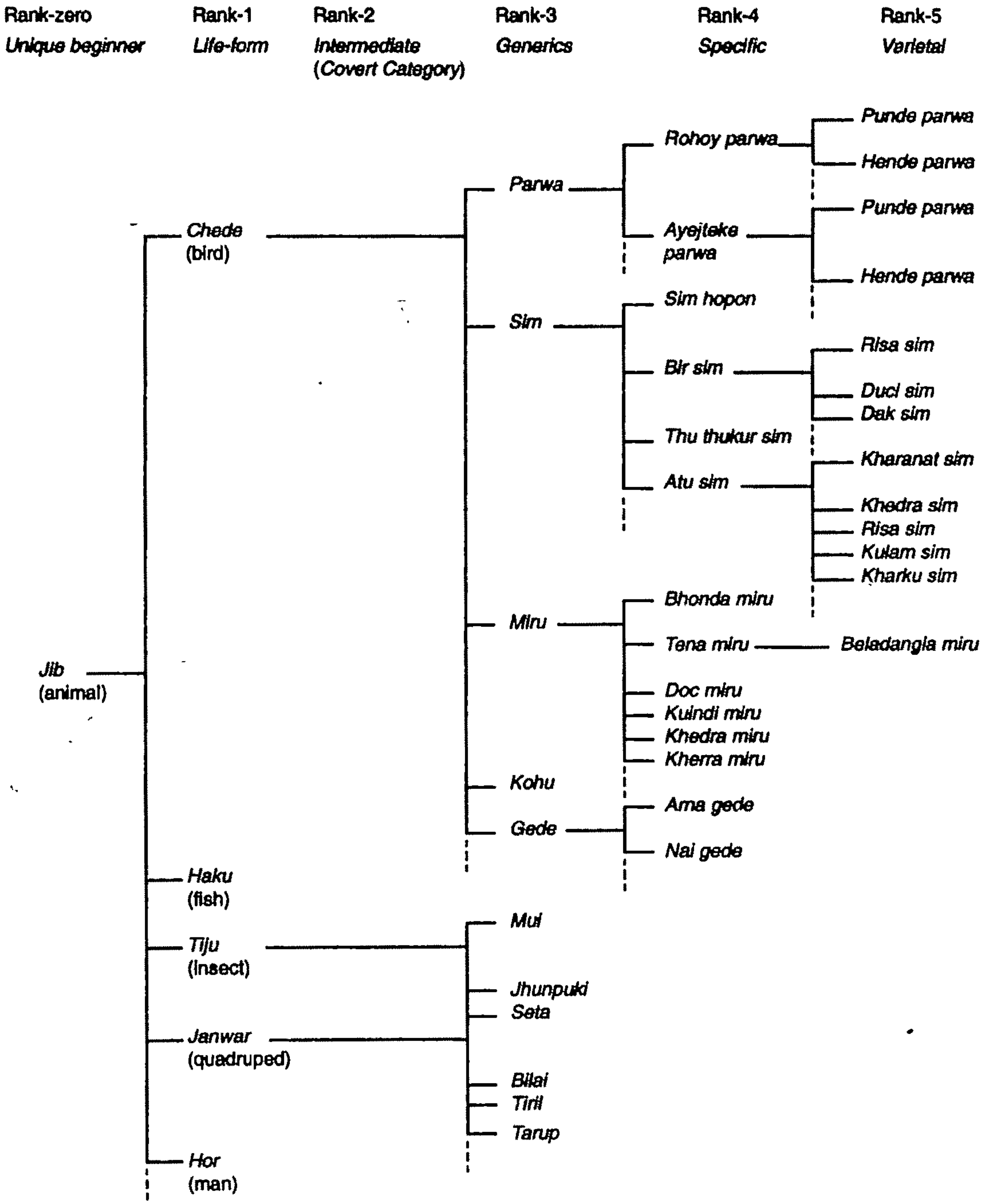

Fig. 10. Folk-taxonomy of *Jib* segregate.

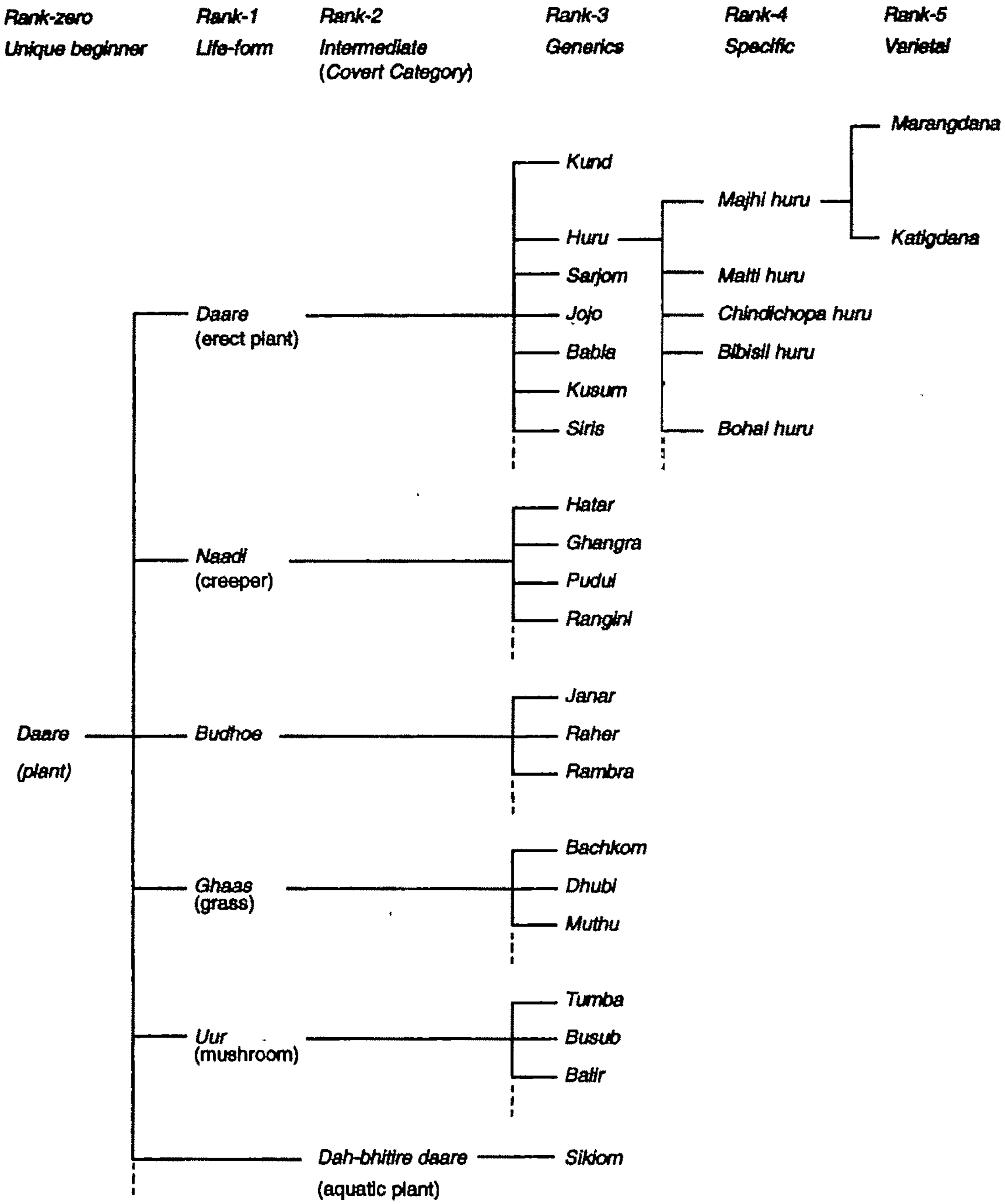

Fig. 11. Folk-Taxonomy of *Daare* (plant) segragate.

The total plant domain is initially categorised into six life-forms (including one covert category Fig. 11). The Santal life forms have a mixture of morphological and functional features. *Daare* is a potential life-form. It means erect tree. It also means tree which has wood for cooking, house-building, furniture of household. Thus life-forms to the Santal taxonomists are not purely 'botanical'.

Atran (1985) pointed out that folk-taxonomies of plants and animals are not commensurate with taxonomies of artifacts. The people recognise that plants and animals are partitioned into natural kinds. These 'natural kinds' are included within the generics. Next to generics the Santal exhibited the level of specifics. In contrast set differences between specifics comprise of small numbers of morphological features : colour and size, specifics are labelled by secondary lexemes which consist of binomial terms such as *majhi huru* in which one part of the term is followed by superordinate class (*huru*).

The Santal expressed generics which are *monotypic* in general. They are not divided into specifics (Geoghegan 1976). Only a few *polytypic* generics are noted. Berlin (1976) pointed out that the number of generics is between 10-20% in most folk botanical taxonomies. The subdivision of generics into specifics is shortly related to its cultural significance.

Specific level should be further divided into varietal level. But the Santal rarely recognise Varietal level. These rareness of varietals indicate lack of strong cultural significance and involvement with fine discriminations.

Among the Santal there is a recognised category of 'aquatic plant'. But there is no single term to designate this group. Rather it is expressed as *Dah-bhitire-daare*. Such groupings are called Covert categories.

From the *ut supra* discussion it is clear that the plant and animal species within entities of each are segregated hierarchically through cultural perception. The different levels of morphological, behavioural and environmental differentiation of species furnish hierarchical classification. Differentiation of plants and animals between an animal or a plant with other animal and plant species is explained by the community on the basis of specific features.

The data on plant and animal species illustrate the logical possibilities arising from initial differentiation in terms of morphological features, behavioural characteristics and functionality.

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Geo-Demographic Structure : Tribal Population of West Bengal

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Abstract : This paper examines spatio-temporal dimension of demographic structure of tribal population of West Bengal. Geo-demographic structure of the tribal population of the State, West Bengal, forms certain clusters at different ecozones. Reasons for such spatial concertrations are : historiography of politico-economic development, demographic changes which have been taking place among the tribal communities due to historical causes and socio-economic programmes implemented since post-independence.

The State of West Bengal is not only characterised by diverse ecozones but also geo-demographic structure of the State varies from place to place. Spatio-temporal distribution of different tribal populations reveals that the diverse ethinic groups of different racial origins are not distributed at random. Rather they spread over the State with their differential population strength which shows a distinct distribution pattern occupying different ecozones. In fact, geo-demographic structure of tribal population of the State form certain clusters at different ecozones in accordance with their respective racial origins. Table : .05 shows present day distribution of tribal populations in eighteen districts of West Bengal as per 1991 census enumeration. It is quite evident from the said table that the tribes of Mongoloid stock have been confined to North Bengal and those of Proto-Australoid stock to South Bengal. In this context, it is important to mention that the tribes of Proto-Australoid stock are also found in North Bengal including Duars region. The people of the Proto-Australoid stock are also found in North Bengal in the recent past primarily in connection with the tea plantation industry. However, different tribal population varies from district to district. It is a unique phenomenon that geo-spatial distribution of Mongoloid stock is conspicuous by its absence from Southern West Bengal. Hence, regional formation is an important characteristic of geo-ethnic spatial distribution of tribal populations of West Bengal.

GEO-ETHNIC REGION FORMATION

Distribution pattern of different tribal communities of West Bengal shows certain regional formations in respect of their bio-social characteristics. There are two distinct broad geo-ethnic zones : (1) Mongoloid tribes of North Bengal and (2) Proto-Australoid tribes of South West Bengal. Though the population of the Mongoloid tribes of North Bengal are not significant in comparison with the tribes of the Proto-Australoid stock, they are important from ethnic point of view. The Mongoloid tribes are mainly Bhutia, Garo, Lepcha, Mech, Nagesia and Toto. They constitute 5.1 per cent of the total tribal population of the State. The Proto-Australoid population originally belonged to South West Bengal. Nowadays they are also found in North-Bengal too. The Santal, Oraon, Bhumij, Munda, Lodha and other tribal communities of South West Bengal represent the Proto-Australoid population of the State. It is important to mention that they constitute more than 94.9 per cent of the total tribal population of the State.

SPATIAL DISTRIBUTION OF TRIBAL COMMUNITIES

Distrbution pattern of the tribal communities of West Bengal reveals certain inter-regional variations in regard to the density of tribal population concentration in certain areas. A cartographic representation of such inter-regional variation of the density of tribal population in 1981and 1991 results in certain degree of unevenness which bring out inter-regional differences in the pattern of spatial agglomeration or dispersion of the tribal population of the State (Map 2)

The basic logic behind such postulation is based upon the data which are empirically verified and have been derived from three main sources of differential pattern of spatial distribution of the tribal populations as given below :

1) Percentage distribution of the tribal population at the district level for the entire area of the State, that is density of tribal population (density of tribal population).

2) Percentage share of the tribal population to the aggregative tribal population of the State that is locational quotients (index of local concentration).

3) The index of comparative distribution as a share of districts tribal population with its share to the total tribal population of the State (index of spatial concentration).

These three parameters are estimated on the basis of three variables; (1) density of tribal population, (2) proportion of tribal population to total population and (3) on pattern of spatial concentration of the population.

On the basis of density of tribal population of different districts, it is found that the tribal populations display a high degree of concentration in a few districts which are situated in two different geographic regions : one is at the submontane region of North Bengal (Darjeeling and Duars) and other in the plateau peneplain regions.The tribal populations are largely confined to some districts which geomorphologically belong to the regions of North Bengal and South West Bengal.

The second parameter is derived from the ratio of the total tribal population in a district and the total population of the same district divided by the ratio of the total tribal population of the State to the total population of the State.

The third parameter is obtained by the index of values which have been derived from the total tribal population in a given district divided by the total population of the State multiplied by hundred.

Therefore, the parameters are :

1) density of tribal population

2) the index of local concentration of tribal population known as local quotients.

3) index of spatial concentration of tribal population in a given district, known as intensity of concentration.

Before going in detail with the estimation of differential population concentration in different regions, it seems important to give a brief generalized view of population size of the tribal population in the State.

Table : .01. Tribal Population, West Bengal 1991

Country / State	Tribal population	Per cent of Tribal population to total population	Per cent of state tribal population to tribal population of the country
India	68,75,965	8.0	—
West Bengal	38,08,760	5.6	5.62

Table : .02. Primitive and Non-Primitive Tribal Populations, West Bengal

Tribal group	Population	Percent
Primitive Tribal Group	64,572	1.695
Non-Primitive Tribal Group	37,44,188	98.305
Total Tribal Population	38,08,760	100.000

It appears from the census of 1991 that the present day tribal population of India is little more than 68 million which constitute 8.0 per cent of the total population of the country. In fact, the tribal population of West Bengal constitutes 5.6 per cent of the total population of the country. In the census of 1991 the total tribal population of West Bengal is estimated as 3.8 million against 67.76 million tribal population for all India. Therefore, it is estimated that 5.62 per cent of the total tribal population of the country live in this State (Table : 01).

The tribal communities have been classified into fifty six major tribal communities and seventy two primitive tribal groups (Sharma 1984). Four tribal communities of the State belong to primitive tribal groups are Toto, Birhor, Kheria and Lodha. The said census (1991) divided the scheduled tribes into two groups as shown in Table : 02. Number and percentage distributions of Primitive Tribal Group and Non-Primitive Tribal Group of West Bengal are shown in the said table (Table : 02)

It is evident from the Table : 02 that there are about 64.6 thousand individuals belonging to Primitive Tribal and 3.74 million Non-Primitive Tribal populations live in the State. Hence, the Primitive Tribal Group comprises 1.7 per cent of the total tribal population of the State and the rest 98.3 per cent are Non-Primitive scheduled tribes.

The four tribes of the State who are considered as Primitive Tribal Groups are Toto, Birhor, Lodha, and Kheria. The Totos are the smallest tribal community who live in the hilly terrain of North Bengal. Five numerically major tribes are the Santal, Oraon, Munda, Bhumij, and Kora. The concentration of the Primitive Tribal Group is not spatially clustered and has not found to be existing is a particular geographical region. And they are rather spatially diffused and live in tribal areas interspersed among other tribal and non-tribal communities without having well-defined territorial distribution pattern except the Totos. However, they are largely distributed in South West Bengal. Two other Primitive Tribal Groups, the Lodhas and Kherias, are bracketed together as the same tribal group in the offical records of the government. In fact, they are two distinct endogamous tribes with different traditions and customs. They are largely distributed in Puruliya, Bankura and South West part of Midnapore districts. Though they are conventionally designated as hunter-gatherers, in real sense, they seem to be destitute tribal population who lost their language and a good number of traditional customs and rituals. At the same time they live interspersed among other non-tribal communities of plateau-peneplain region of South West Bengal. In fact they are considerably much Hinduized and actually occupy a very low position in Hindu dominated social hierarchy of the regional social system (Danda; 1991 : 7).

In North Bengal, one primitive tribal community, the Totos, are found in a pocket. The Totos are confined to Totopara, a small village under Madarihat police station in the district of Jalpaiguri which lies between 89°20′ East latitude and 26°50′ North longitude. On the other hand, another primitive tribal community, the Birhaors - a hunter gatherer tribe, are found to be concentrated in Bagmundi and Jhalda, two police stations of Puruliya district of West Bengal which are situated between Bengal-Bihar border. Geomorphologically this area of Bagmundi plateau is continuation of Ranchi-Hazaribagh plateau complex. Among the Birhors only less than one thousand individuals (a negliigible percentage), live in West Bengal and the rest of the tribal population are largely found in Bihar and other neighbouring States. Therefore, only a microscopic minority of hunting-gathering population has been living in West Bengal.

Table : .03. Numerically Major and Minor Tribes.

Numerically Major Tribe	Per cent	Numerically Minor Tribe	Per cent
Santal	54.3	Birjia	0.030
Oraon	14.3	Toto	0.029
Bhumij	7.6	Birhor	0.021
Munda	7.5	Khond	0.021
Kora	3.2	Chakma	0.005

In has been found that the numerical strength of the tribes varies from one community to another. Five numerically major tribal communities of the State are the Santal, Oraon, Bhumij, Munda and Kora (Table : 03) who constitute more than 85 per cent of the total tribal population. The tribal populations of the State can also be classified on the basis of their numerical strength. It is also important to note that the tribal communities of West Bengal are not homogeneous in demographic characteristics. The Santals constitute about 54.3 per cent of the total tribal population of the State. The Oraon occupies the second position as they constitute 14.3 per cent. The Bhumij holds third position who constitutes 7.6 per cent of the total tribal population of the State. The Munda along with Kora constitutes about 11 per cent of the total tribal population.

Table : .04. Classification of Tribal communities by Per cent Distribution.

Category	Range of percentage (in each category)	Number of Tribal group in the category	Percentage of total Tribal population of the State
Predominantly Major	above 50	1	54.30
Major	15 to 50	3	29.34
Medium	7.5 to 15	5	9.06
Minor	1 to 5	5	3.92
Insignificant	below 0.5	24	3.38

Numerically, five minor tribes are Birjia, Toto, Birhor, Khond and Chakma (Table : 03). Among five minor tribes, from the point of view of the numerical strength of population, two tribes, Chakma and Khond are the original inhabitants of Bangladesh and Orissa respectively. Only Lodhas and Kherias are representatives of numerically minor tribal groups who live in South West Bengal. However, the numerical strength of Birhors, Chakmas and Khonds are not more than 0.05 per cent, but the Lodhas/Kherias constitute 1.95 per cent of the total tribal population and they are found mostly in Midnapore, Bankura and Puruliya districts. As mentioned elsewhere, the Primitive Tribal Group constitutes only 1.7 per cent of the total tribal population of the State of which Lodha/Kheria are the predominant tribes. Therefore, even the Primitive Tribal Groups clustering is confined to South West Bengal. The per cent distribution of numerically major and minor tribal populations is shown in Table : 04

Table : .05. Distribution of Population (1991)

Name of the District	Scheduled Tribe population	Per cent ot total Scheduled Tribe population	Scheduled Tribes	
			Non-primitive	Primitive
(i)	(ii)	(iii)	(iv)	(v)
1. Cooch Bihar	13,275	0.35	13,075	200
2. Jalpaiguri	5,89,225	15.47	5,53,717	35,509
3. Darjeeling	1,79,153	4.70	1,76,675	2,478
4. West Dinajpur (N)				
5. West Dinajpur (S)	3,07,487	8.07	3,07,206	281
6. Malda	1,71,326	4.50	1,71,313	13
7. Murshidabad	61,513	1.62	61,483	30
8. Nadia	90,525	2.38	89,925	600
9. 24-Parganas (N)	1,69,831	4.46	1,58,583	1,248
10. 24-Parganas (S)	70,499	1.85	70,431	68
11. Calcutta	8,593	0.23	8,501	92
12. Haora	10,090	0.26	10,017	73

Table : .05. Distribution of Population (1991) (*Contd.*)

Name of the District (i)	Scheduled Tribe population (ii)	Per cent ot total Scheduled Tribe population (iii)	Scheduled Tribes Non-primitive (iv)	Scheduled Tribes Primitive (v)
13. Hugli	1,76,401	4.63	1,74,403	2,358
14. Midnapore	6,89,636	18.11	6,70,097	19,539
15. Bankura	2,89,906	7.61	2,89,567	339
16. Puruliya	4,27,766	11.23	4,26,434	1,332
17. Bardhaman	3,76,033	9.87	3,75,621	412
18. Birbhum	1,77,501	4.66	1,77,501	—
West Bengal	38,08,760	100.00	37,44,549	64,572

From the demographic point of view, the tribal communities of West Bengal can also be grouped on the basis of their representative numerical strength as well as in terms of percentage distribution of the population. The tribal communities can be classified into five categories as predominantly major, major medium, minor and insignificant. The numerical ordering of the tribal communities based on percentage distribution is shown in the Table : 04. It is evident from the Figures .01 and .02 that there is only one tribal community, the Santal, who belongs to predominantly major category and three tribal communities belong to major category. The medium category comprises only 5 communities. There are 29 tribal communities who belong to minor and insignificant categories.

Table : 05 represents district-wise distribution of the tribal population of the State as per Census of 1991. Table : 06 shows change of tribal population in different districts during 1961-91. Distribution of tribal population by districts in 1991 census reveals that little more than 18 per cent of the total tribal population live in Midnapore, 15.5 per cent in Jalpaiguri, 11.2 per cent in Puruliya, 9.9 per cent in Bardhaman and 7.6 per cent in Bankura. (Map 3)

Spatial distribution of the tribal population in the State can be measured by the locational quotient which has been found useful as an index of concentration of tribal populations (Raza and Ahmad 1991 : 33,45). The location quotient can be expressed as follows :

Lq= (ek/EK) / (Pt/t) (Where ek represents total population of the district of the State, EK represents total population of the State). The locational quotients of the tribal population of the State lead to the grouping of the districts of West Bengal into five categories as shown in Table : 07.

It is evident from the Table : 07 that three districts, jalpaiguri, Darjeeling and Puruliya having locational quotients of 2.0 to 3.76, are situated in rugged, hilly and plateau regions of the State.

Index of concentration is another measure magnitude of spatial concentration of the tribal population at district levels. As the measure, index of concentration, demonstrates the share of a district in the total population of the State, it reveals the regional contrast in the spatial clustering of the tribal population. The index value can be computed from the following formula : Ptd/Ptx100 (where Ptd represents total tribal population in a district and Pt represents total tribal population in the State). The values of index of concentration for different districts of the State are given in Table : 08.

Table : .06. Change of Tribal Population in Different Districts, 1961-91.

District	Per cent of Tribal population to the total population of the District				Change in the percentage of Tribal population to total population		
	1961	1971	1981	1991	1961-71	1971-81	1981-91
Cooch Bihar	0.86	0.75	0.54	0.61	-0.11	-0.33	+0.19
Jalpaiguri	26.10	24.49	22.20	21.04	-1.61	-6.49	+63.04
Drjeeling	15.44	13.89	14.75	13.76	-1.55	-9.89	-9.76
West Dinajpur	12.85	11.90	10.82	9.83	-0.95	-3.9	+1.83
Malda	8.14	8.11	7.54	6.49	-0.03	-2.11	+0.49
Murshidabad	1.37	1,33	1.22	1.25	-0.04	-0.67	-0.75
Nadia	1.28	1.43	1.89	2.35	0.15	+10.43	+1.35
24-Parganas (North)	1.90	1.62	1.76	2.33	-0.28	+3.38	-3.2
24-Parganas (South)				1.23			
Calcutta	0.08	0.08	0.13	0.19	0.00	+0.01	+0.10
Haora	0.30	0.14	0.25	0.27	-0.16	+0.18	-0.5
Hugli	4.04	3.49	3.96	4.05	-0.55	+0.51	+0.05
Midnapore	7.59	8.04	4.99	8.27	+0.45	+0.96	-5.73
Bankura	10.42	10.28	10.55	10.34	+0.14	+2.28	+2.34
Purullya	19.33	19.58	18.79	19.23	+0.25	-7.58	-7.23
Bardhaman	5.84	5.84	5.75	6.21	0.00	+3.16	-2.79
Birbhum	7.39	7.05	5.92	6.94	-0.34	-2.05	+1.94
West bengal	5.88	5.72	5.63	5.60	-0.16	-0.10	-0.02

It appears from the Table : 08 and Map 3 that locational quotations and values for index of concentration for different districts maintain a pattern of parity with regard to distribution of the tribal population in different districts of the State.

Table : .07. Locational Quotients of Tribal Population, West Bengal, 1961-91

District	1961	1971	1981	1991
Cooch Bihar	0.13	0.11	0.10	0.11
Jalpaiguri	1.80	3.53	3.96	3.76
Darjeeling	2.58	2.00	2.62	2.41
West Dinajpur	1.87	1.72	1.82	1.76
Malda	1.17	1.19	1.33	1.16
Murshidabad	0.19	0.20	0.21	0.04
Nadia	0.19	0.21	0.33	0.42
24-Parganas (North)				
24-Paraganas (South)	0.28	0.33	0.30	0.42

Table : .07. Locational Quotients of Tribal Population, West Bengal, 1961-91

District	1961	1971	1981	1991
Calcutta	0.01	0.01	0.02	0.03
Haora	0.04	0.02	0.04	0.04
Hugli	0.59	0.50	0.70	0.72
Midnapore	1.11	1.16	1.42	1.48
Bankura	1.52	1.48	1.87	1.85
Puruliya	2.81	2.82	3.33	3.44
Bardhaman	0.85	0.84	1.01	1.11
Birbhum	1.08	1.02	1.23	1.24

The above data on the spatial concentration of tribal population indeed shows some sort of regional pattern arrangement of the tribal population in spatio-temporal context. It is found that geographical distribution of the tribal communities shows certain geoethnic pattern arrangement. Therefore, the geo-ethnic cluster distribution of tribal population pattern reveals distinct spatial divisions and region formations. Such geoethnic divisions for spatial concentration of the tribal communities can be arranged in five distinct geo-ethnic zones as follows :

Table : .08. Locational Quotients, Index of Concentration and Tribal Population

Sl. No.	Category	Locational Quotient	Index of Concentration
1.	2.0–3.76	Darjeeling (2.46)	13.76
		Puruliya (3.44)	11.92
		Jalpaiguri (3.76)	21.04
2.	1.5–2.0	Midnapore (1.48)	8.27
		West Dinajpur (1.76)	9.83
		Bankura (1.85)	10.34
3.	1.0–1.5	Bardhaman (1.11)	6.21
		Malda (1.16)	6.49
		Birbhum (1.24)	6.9
4.	0.5–1.0	Hugli (0.43)	4.05
		Nadia (0.42)	2.35
		24-Parganas (0.42) (North + South)	2.33
5.	Below 0.5	Cooch Bihar (0.10)	0.61
		Calcutta (0.32)	0.19
		Murshidabad (0.04)	1.25
		Haroa (0.048)	4.05

1. The sub-mountain region of the Himalayas (Tista Valley and Duars) which includes mainly Darjeeling and Jalpaiguri districts and this region was originally inhabited by the Mongoloid tribes. They are mainly Bhutia, Lepcha, Mech and Nagesia. In recent past the Proto-Australoid tribes namely the Oraon, Munda and Santal came and started to live here. The Proto-Australoids were brought to work as labourers in Tea plantation industry. Ray (1964 : 84) has observed that the Mongoloid tribes namely, Mech and Rabha do not like to work in plantation industry which is alien to their traditional way of living.

Table : .09. Locational Quotients and Index of Concentration of Tribal Population, West Bengal

Locational Quotients		Index of Concentration
Cooch Bihar	0.11	10.61
Jalpaiguri	3.96	21.04
Darjeeling	2.41	13.76
West Dinajpur	1.76	9.83
Malda	1.06	6.49
Murshidabad	0 039	1.25
Nadia	0.42	2.35
24-Parganas (North)	0.42	2.33
24-Parganas (South)	0.42	2.33
Calcutta	0.032	0.19
Haora	0.048	0.27
Hugli	0.72	4.05
Midnapore	8.27	1.48
Bankura	10.34	1.85
Puruliya	11.92	3.44
Bardhaman	6.21	1.11
Birbhum	6.94	1.24

2. The second geoethnic zone is the older deltaic plain of North Bengal known as Barind which includes West Dinajpur, Malda and Cooch Bihar. The Garos, a matrilineal Mongoloid tribe, live here but their population is only one per cent of the total tribal population of the State. They originally migrated from the State of Meghalaya. However, a considerable number of the Santals are also living in West Dinajpur and Malda. They also originally migrated from the neighbouring State, Bihar. Toto, rarely work in tea gardens. Almost the entire labour force in tea plantation consists of tribal immigrants who were supplied from the Chotanagpur plateau.

Table : .10. Distribution of Tribal Population in West Bengal (1991 Census)

Name of the District (I)	Scheduled Tribe population (II)	Percentage to Scheduled Tribe population (III)
1. Cooch Bihar	13,275	0.35
2. Jalpaiguri	5,89,225	15.47
3. Darjeeling	1,79,153	4.70
4. West Dinajpur (N)	3,07,487	8.07
5. West Dinajpur (S)		
6. Malda	1,71,326	4.50
7. Murshidabad	61,513	1.62
8. Nadia	90,525	2.38
9. 24-Parganas (N)	1,69,831	4.46
10. 24-Parganas (S)	70,499	1.85
11. Calcutta	8,593	0.23
12. Haora	10,090	0.26
13. Hugli	1,76,401	4.63
14. Midnapore	6,89,636	18.11
15. Bankura	2,89,906	7.61
16. Puriliya	4,27,766	11.23
17. Bardhaman	3,76,033	9.87
18. Birbhum	1,77,501	4.66
West Bengal	38,08,760	100.00

3. The third zone is the western lateritic plateau peneplain region between the Bhagirathi, Hugli and peninsular region of Chotonagpur plateau. This region includes Puruliya and a part of Bankura, Bardhaman, Birbhum and western part of Midnapore districts. The cultural evidence of early man were recorded from this region as early as 1880 by a geologist, Valentine Ball. This region is inhabited by the Proto-Australoid people who speak dialects of Austro-Asiatic and Dravidian groups of families. The Santal, Oraon, Munda, Ho, Bhumij, Birhor and many other tribal communities are living in this region for a long time. This region can be termed as a 'compact periphery' of the Santals who have their core in Mayurbhanj district of Orissa and Santal Pargana of Bihar. However, it seems that they may have their original habitation in some areas of Jhargram subdivision, Midanpore, West Bengal.

4. The fourth zone is the Moribund delta of the Ganga which mainly includes Murshidabad, Nadia and a portion of Hugli and Bardhaman. Here, the concentration of tribal people is very less. They had migrated here in search of work and engaged in cultivation and also worked as agricultural labourers as well as non-agricultural daily labourers.

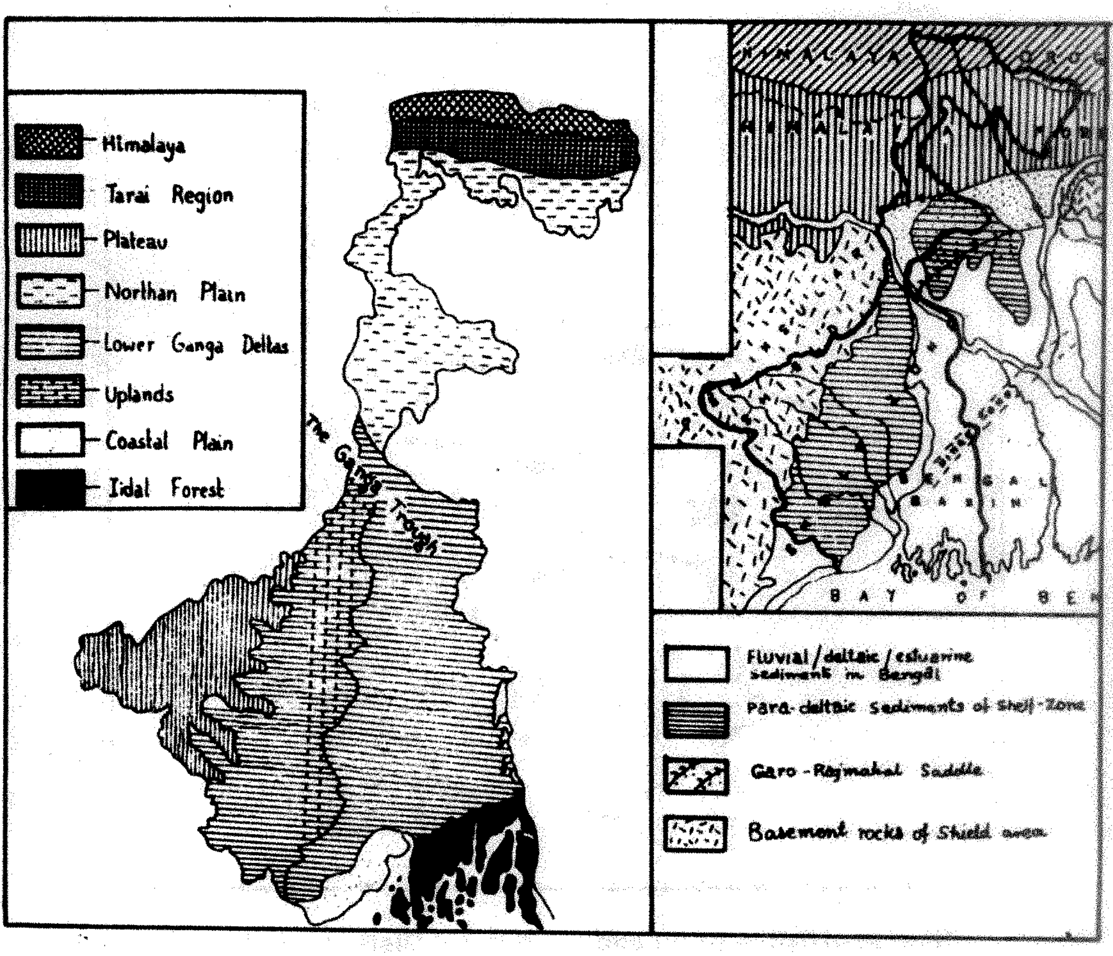
5. The fifth geographic zone is the mature and active delta of the Ganga which includes North and South 24 Parganas. The British indigo planters and local Zamindars brought the tribals to this area for reclamation of the land for cultivation. They emigrated and settled here towards the end of eighteenth century.

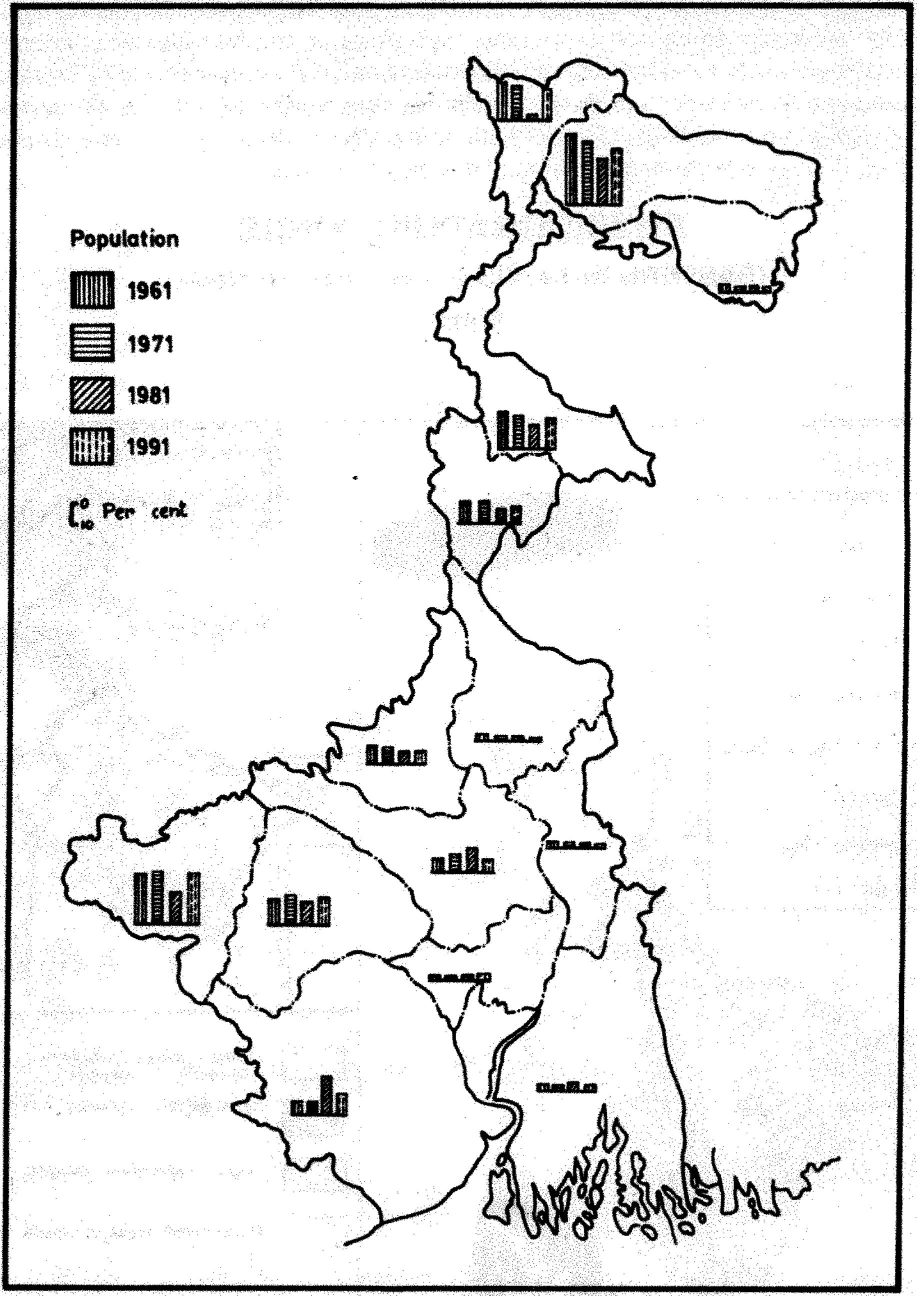
Eluciding from the above discussion, it can be suggested that the tribal distribution pattern of West Bengal shows some sort of regional formations so far their cluster concentration in geographical region is concerned. Such concentration is mainly occurred due to (1) historiography of politico-economic development during the British imperialist colonial rule; (2) demographic change of ethnic communities, (3) socio-economic and political factors and development programmes of post-independence period of the Indian Republic.

PHYSIOGRAPHIC ZONES

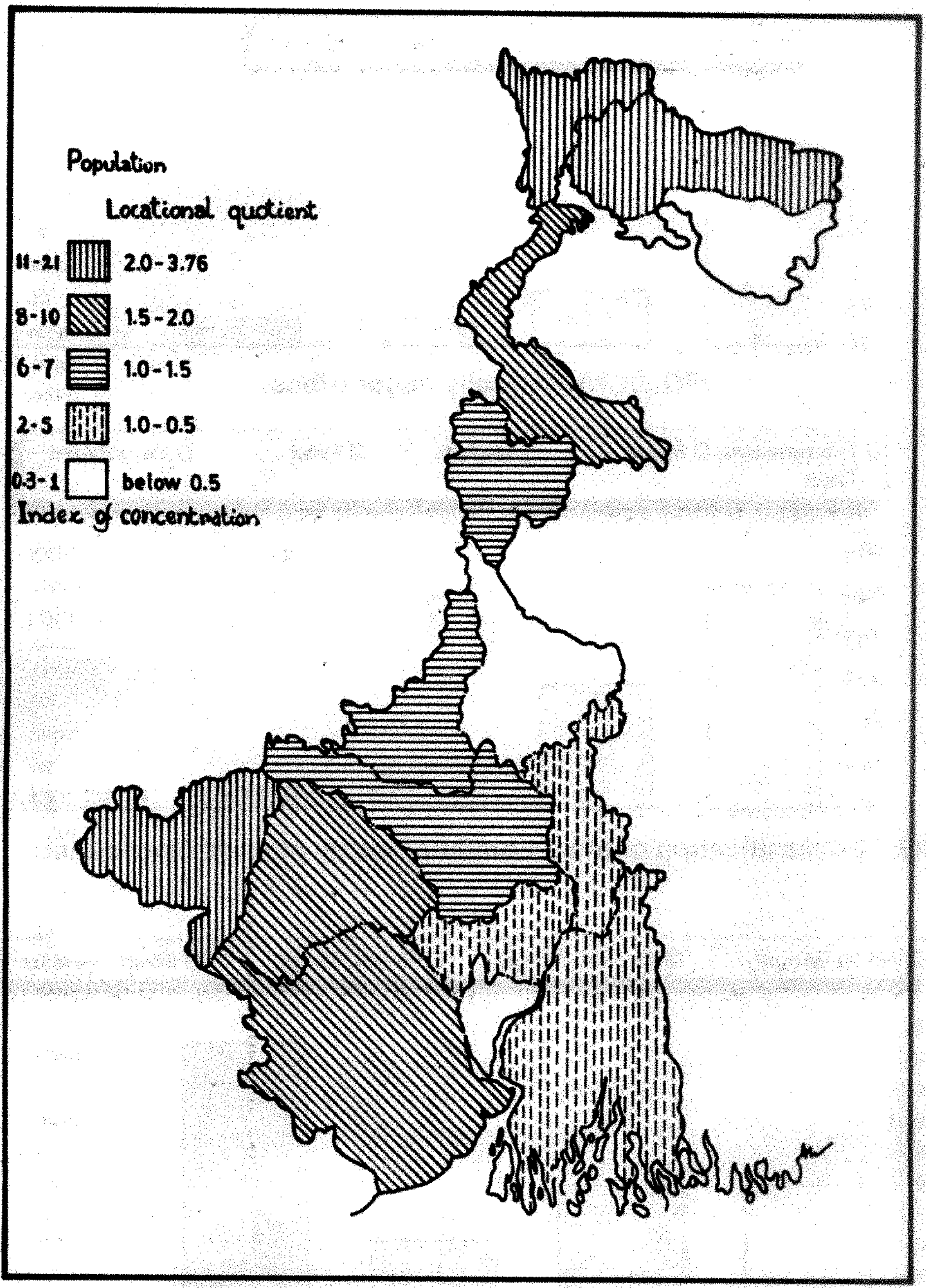
(EASTERN INDIA VIS-A-VIS WEST BENGAL)

Map 1





Change of Tribal Population in differnt District, 1961-91
Map 2



Locational Quotient, Index of Concentration and Tribal population
Map 3

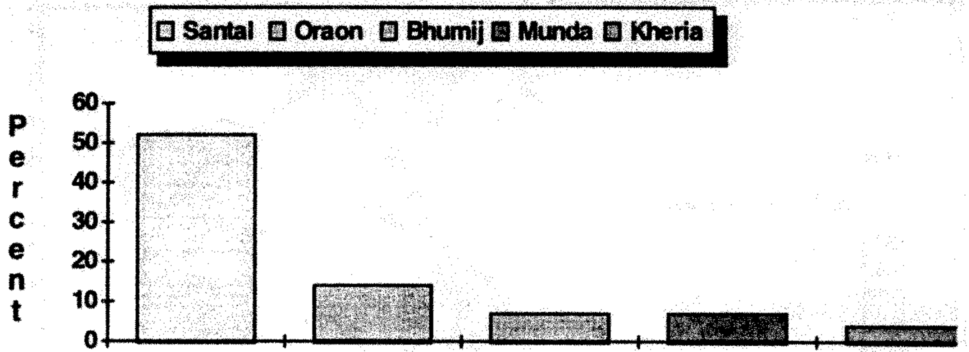


FIG. 01 Numerically major tribes.

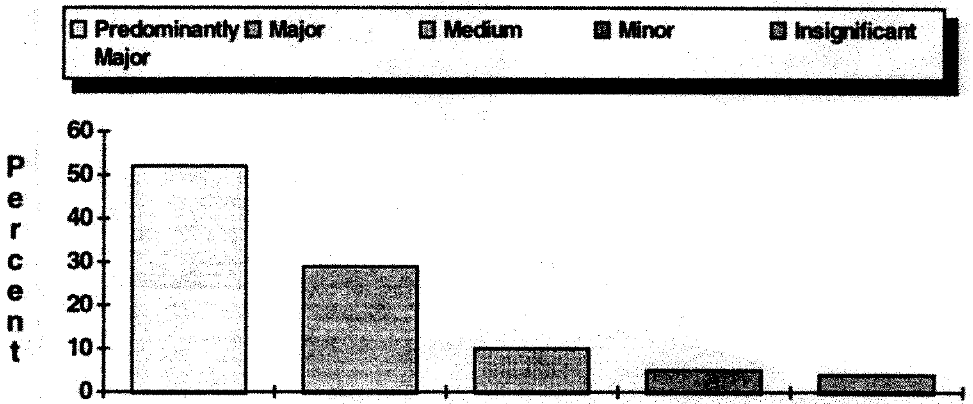


FIG. 02 Classification of tribal communities by percent distribution.

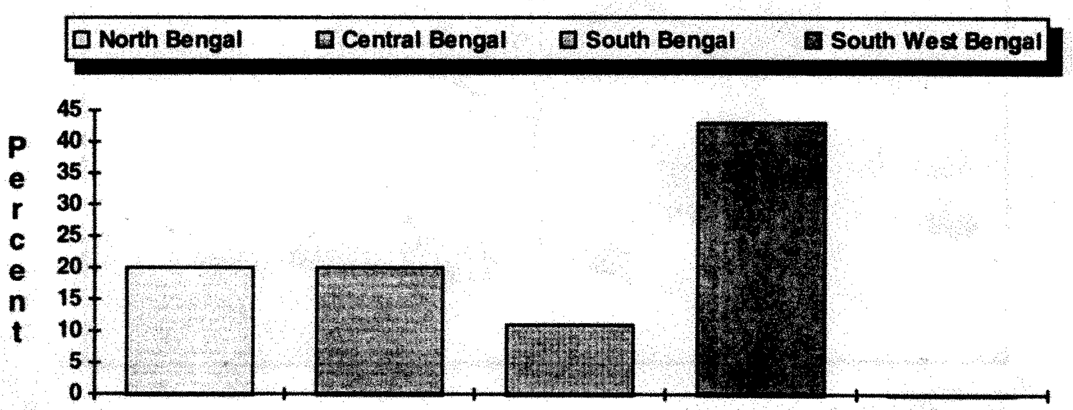


FIG. 03 Distribution of population 1991 census

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Biogenetic study on Cerebral palsy

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Cerebral palsy is known to be a disorder of motor control resulting in abnormalities in posture, muscle tone, reflexes, and motor cordination and is believed to be a result of injury or abnormal morphogenesis of motor region of immature developing brain. Sen et. al. (1994) defined the cerebral palsy as 'a permanent and non-progressive disorder of children with localisation of lesion in the brain, the lesion arising in life and interfering with the normal development of the brain, characterized by a clinical picture which is dominated by a disorder of movement, posture, and impairment of voluntary muscle activity and sometimes complicated by other neurological complications and mental retardation'.

Children with cerebral palsy are in majority handicapped with other abnormalities leading to visual, hearing and impairment of speech and language disorders and epilepsy.

Exact itiology of cerebral palsy although is yet to be thoroughly known, adverse obstetrical complications believed earlier as major cause has not been fully established, as several studies show the increase of cerebral palsy even with imporoved obstetrical care (Lamb and Lang, 1992).

Since the pubication of Lejeune et, al. (1959) showing the association between trisomy 21 and Down syndrome, hundreds of authors using cytogenetic techniques demonstrated the existance of association of a number of syndromic disorders associated with chromosomal anomalies; developmental delay and mental retardation were noted to occur as constantly associated features (de Grauchy and Turleau, 1977, Schinzel, 1964). Recently McKusick and Amberger (1993, 1994) brought out a compendium related to morbid anatomy of human genome.

Cooper et. al. (1965) probably was first to point out the genetical implication of cerebral palsy which was in later years supported by Monreal (1985) and Kanata (1986a and 1986b). Kanata (1986a) studies 58 cases of severe mental retardation with cerebral palsy and demonstrated chromosomal abnormalities in 8.6% cases. Chromosome no.9 was found to have a high susceptibility for structural rearrangement and in two cases centromeric constriction studied by G banding revealed pericentric inversion. Subsequent studies of Kanata et. al. (1986) and earlier study of Kodama (1982) stood in agreement with findings of Kanata (1986a). Studies of Eckstein et. al. (1977) and Sen et. al. (1994) were, however, to some extent different from those of the Japanese authors.

On the back ground of the above mentioned experience, a study was undertaken on cerebral patients covering different biogenetical parameters including cytogenetics, ABO and Rh blood groups, dermatoglyphics and others. In the present communication findings on some of the biogenetic parameters and cytogenetic parameters of the cerebral palsy pateints are reported.

MATERIAL AND METHOD

Material for the present study comprised 50 cerebral palsy patients of both sexes (males-30, females-20) beloging to different age-groups. Patients were diagnosed by the Department of

Neurobiology, Vivekananda Institute of Medical Sciences (Ramakrishna Mission Seva Pratisthan) and were sent to the Department of Genetics of the same Institution for study. Studies on different parameters of the patient including karyotype of the patients and in several cases of their parents were undertaken. Leucocyte culture was initiated according to standard method (Moorhead, 1964). Chromosomes were identified and Karyotyping was done following standard nomenclature (Hammerton, 1962, Grouchy and Turleau, 1977).

RESULT AND DISCUSSION

Result obtained by analysis of the data has been presented in tables1 and 2.

Table-1 Biogenetic details of the patient

Parameter	Range	Mean		S.E.	S.D.
Age (Yrs.)	0.5 – 24.6	7.70	±	1.30	6.89
Birth order	1.0 – 5.0	2.38	±	0.24	1.09
Birth weight (Kg.)	1.6 – 3.5	2.45	±	0.14	0.98
Age of mother (Yrs.)	24 – 50	33.58	±	2.14	9.34
Age of father (yrs.)	27 – 69	40.68	±	2.46	10.75

Table–2 Result of Karyotyping

Sex	No.	Karyotyping					
		Normal		Abnormal			
		No.	Modal Number	Structural No.	Modal Number	Numerical No.	Modal Number
Male	30	11	46 XY	15	46 XY	4	47 XY
Female	20	8	46 XY	8	46 XX	4	47 XY
Total	50	19	46 XY/46 XX	23	46 XY/46 XY	8	47 XY/47 XX
		(38.00%)		(46.00%)		(16.00%)	

It will be apparent from the foregoing presentation that out of 50 patients, in 19 (38.00%) no structural as well as no numerical abnormality in their chromosomal constitution could be encountered. In 23 (46.00%) patients, structural abnormality in the form of deep constriction in the centromeric region in one of the A group chromosome (A2) could be seen. In one patient besides the above dicentric chromosome in B group could also be seen. In addition to the above 8 (16.00%) patients showed numerical abnormalities in group G (G 21). When these patients were categorised as Down, 54.76% of the patients were found with structural abnormalities. Majority of them were with deep constriction in the centromeric region amounting to pericentric inversion in one of the A group (A2) chromosomes.

It will be apprent from the above that the chromosomal abnormality of similar nature i.e. centromeric constriction amounting to pericentric inversion as noted in our study has been reported by the Japanese authors (Kanata 1986a and 1986b and Kanata et. al. 1986). In the study undertaken by the Japanese authors, abnormalities were observed in chromosome 9, while in the present series, abnormality was located in chromosome 2 (A2). These might be due to ethnic variation between Japanese and Indian population so far as the genetic abnormality in cerebral palsy was concerned. Eckstein et. al. (1977) also reported abnormality in chromosome A (one member of chromosome pair 3) in one child with cerebral palsy.

Evolutionary sequences of chromosome A (A2) have been well studied by a number of authors (Grouchy and Turleau 1977). Chromosome A2 has played an important role in the differentiation of human species and it was represented in the three hominid primates (Chimpanzee, Gorilla and Orang-utang) by two acrocentric chromosomes; their fusion in the human phylum explained the transition from a chromosome number of 2N = 48 in the great apes to 2N = 46 in man. Pericentric inversion in A2 chromosome is frequently seen among the couples with reproductive disorders, spontaneous abortions and with the birth of malformed children, still births and early deaths. Observations of unbalanced rearrangement in the living children are no doubt rare. Observation of constriction in the centromeric region of A2 chromosome in the cerebral palsy patients thus calls for attention for further study of the problem.

ACKNOWLEDGEMENTS

Authors are thankful to the authorities of Vivekananda Institute of Medical Sciences (Ramakrishna Mission Seva Pratisthan), Calcutta, and D.R.S. Programme, Department of Anthropology, Calcutta University for necessary help for the study.

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Trends of Research Methods in Ethnoecology

SYAMALKANTI SENGUPTA AND DEBASISH GHOSH

Abstract : Ethnoscience or ethnoecology refers to a group's knowledge, conception and classification of objects, as well as the biotic interrelationship around them. Ethnoscience provides explicit methodology to unravel how community members organise and express their knowledge of understanding of their cognized environment. Since ethnoscience uses the concept of structural linguistic, it utilises sentence frames derived from the language of the people being studied. In this regard it is important to learn from the informants how to ask linguistically correct question to get correct responses. The important methods are *controlled eliciting, eliciting folk definition and direct question/response*. Informants are asked to construct "folk classification" of nature with the assumption that the classifications are important clues to the way that people have coped with environmental problems. The most common methods to arrange native classifications are – Taxonomies, paradigm and Key.

The term ethnoscience or ethnoecology is in itself a compound one. The prefix ethno–takes on a new meaning in this context. It refers to a group's view or conception of the nature of ecology (environment) around him. Ethnoecology would similarly be a group's conception of biotic interrelationships in its universe. Thus ethnoscience would become the sum total of a group's knowledge, conception and classifiction of objects, activities and events of its social and material world (Sturtevant, 1964).

Ethnoecology as a method and an orientation to ethnographic ecology is a part of the larger and more inclusive field of ethnoscience, which aims at an explicit methodology for studying how community members express their knowledge and understanding of their world. In a sense, it attempts to equip one to listen on the frequencies community members themselves use to communicate their perceptual understandings.

In course of action for dealing with the phenomena people see and to which they respond exclude at the outset such attitudes or knowlege which the informants sometimes fail to express verbally – for example the meaning of a facial expression. Despite its limitations, however ethnoscience offers a starting point for a rigourous and systematic investigation of 'norms' and 'values'.

Since ethnoscience uses the concept of structural linguistic to get what Rappaport (1963) calls the "cognitized" environment, the environment that is actually perceived by a human group (Anderson, 1973), informants are asked to construct "folk classification" of nature with the assumption that the clasifications are important clues to the way that people have coped with environmental problems. Classificatory systems reflected in native terminologies, hold important clues to understand the mental processes by which cultural knowledge is coded and recalled (Conklin 1962; Frake 1962).

"The analysis of a culture's terminological systems will not, of course, exhaustively reveal the cognitive world of its members, but it certainly will tap a central portion of it. Culturally significant cognitive features must be communicable between persons in one of the standard symbolic system of a culture. A major share of these features will undoubtedly be codeable in a society's most flexible and productive communication device, its language. Those cognitive features requiring most frequent communication will tend to have standard and relatively short linguistic labels" (Frake, 1962).

The features of language commonly chosen for analysis of native classifications are lexemes. Lexemes may be words, complexes, phrases or other units of speech that serve to label segregates, or any terminologically distinguished grouping of objects (Conklin, 1962). In many cases the referent of a lexeme will be a segregate that is unrelated to the typical referents of its component linguistic parts. Segregates which express a distinct sphere of meaning, within a given culture constitute a domain. Domains are culture specific, their boundaries and contents are discovered and defined in terms of culture being investigated rather than in terms of external or cross-cultural criterion (Sturtevant, 1964). Delineation of the boundaries, contents and external and internal relationships for domains in different languages and cultures is the primary objective of the methodology of ethnoscience or ethnoecology.

It's procedures are summerized as follows :

1. Collection of a corpus of terms through use of eliciting frames.
2. Reduction of the corpus to a set of stable, mutually contrasting terms.
3. Investigation of the semantic organisation of the reduced set of terms, using the principles by which native speakers contrast terms and group them into larger catergories, and
4. Development of a set of native "rules of correspondence" by which informants relate their "native concepts" to their practical experience.

METHODS

Most important fieldwork techniques and methods are —

1. Controlled Eliciting – It utilizes sentence frames derived from the language of the people being studied. This involves the use of linguistically correct questions that relate concepts meaningful in that culture (Tyler, 1971).

The eliciting process serves to formalize somewhat an activity that is talking with informants. Formalization further means "making explicit the logical structure of a set of assertions" (Berger and others, 1962). One aspect of such structure can be described as the sets of questions which correspond to the assertions (beliefs and actions) of a cultural group. With these eliciting procedures one tries to learn the questions that go with native assertions, in the logic of the culture under study, and to report these explicitly (Black, 1965).

In this regard it is important to learn from the informants how to ask questions in their language and what constitutes a "correct" response. It involves training of the informants as well as researcher himself to work simultaneously on several levels of pattern finding. Reactions of the informant to the phenomenon of his experience tell the researcher what he wants to know. For this, researcher needs to develop the craft of sensitive and systematic observer.

2. Eliciting folk definition – Each native term becomes the focus of a folk definition, with the definition subsequently being analysed for taxonomic elements as well as their relational principles.

3. Direct Question/Response – Informants are questioned directly about taxonomies through a controlled set of question frames, appropriate responses to each question then become the focus of a new frame until a terminal response is reached.

METHODS OF ANALYSIS

The nature of folk terms and the relationships among them are the most common systems for native classification through taxonomies, paradigm and key.

1. Taxonomy – A folk taxonomy has been described as "the grouping of entities according to the category labels given to them by the culture" (Mathiot, 1962). The labels are words in the native language. Taxonomies make possible a regulation of the amount of information communicated about an object in a given situation, and they provide a hierarchical ordering of categories, allowing an efficient programme for the identification, filing, and retrieving of significant information (Herdan, 1960). In taxonomies, terms and their referents are related to each other according to the principles of inclusion and contrast (Frake, 1962b). "Terms related by inclusion are those that can be hierarchically arranged from general to specific. Terms related by contrast are those presented on any single horizontal dimension of a taxonomy. Taxonomies are commonly presented in the form of multibranching tree diagrams. The taxonomic relations, X is a kind of Y, is one of the major ways in which people organise knowledge."

Typical five levels – unique beginner, life form, generics, specific, and varietal – as distinguished by Berlin, Breedlove and Raven (1973, 1974) were not very distinct, rather different attributes play important role in identifying and placing the animal in the taxonomy (Diagram – 1). Each level of folk taxonomy forms a rank, or level of grouping. Rank zero consists of a single term which refers to everything included in the taxonomy, called the unique beginner. The term *jib* used to refer to the things having life and thus includes entire animal kingdom in a rank zero. Then comes the life-forms in rank one. They always have a number of subordinate groupings. Next to life-form groupings at rank two are generics. The generics are the basic core of the folk taxonomy.

Next to generic level comes the specifics. Most specifics occur in sets of two or three members. The differences between specifics in the same contrast set usually consist of a very small number of morphological features, such as colour and size. [e.g. *hende pussy* (Black cat)]. At the most detailed level of folk taxonomy is the varietal having cultural significance.

Intermediate category occurs between rank life-form and generics, in most cases they are not labelled (D, Andrade 1962, Berlin, Breedlove and Raven 1968). The intermediate category for *Pussy* (Cat), *Tarup* (Tiger) and *Singho* (Lion), sometimes is referred as something like cat. These people often refer to a Tiger as a *marang pussy* (big size cat). The term *hende pussy* and *dhobo pussy* form a clear contrast set on colour of secondary lexemes typical of folk specifics.

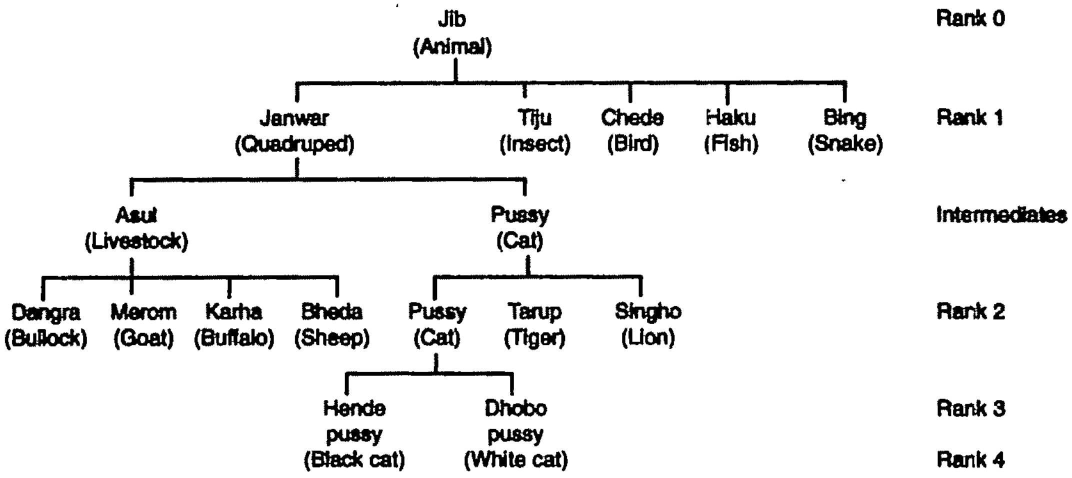


Diagram – 1 : Partial Santal Taxonomy of *Jib* (Animal)

The elaboration of taxonomies probably depends on cultural settings within which one talks about the objects being classified (Frake, 1961), the importance of the objects to the way of life of the classifiers (Brown, 1958; Nida, 1958), and general properties of human thinking about the number of items that the mind can cope with at a given point of time (Miller, 1956).

2. Trees – In addition to taxonomies semantic features may be arranged on a branching tree diagram, called a tree. Features in a tree are ordered by sequential contrast of only one feature at a time. Trees are thus based on successive choices between two alternatives.

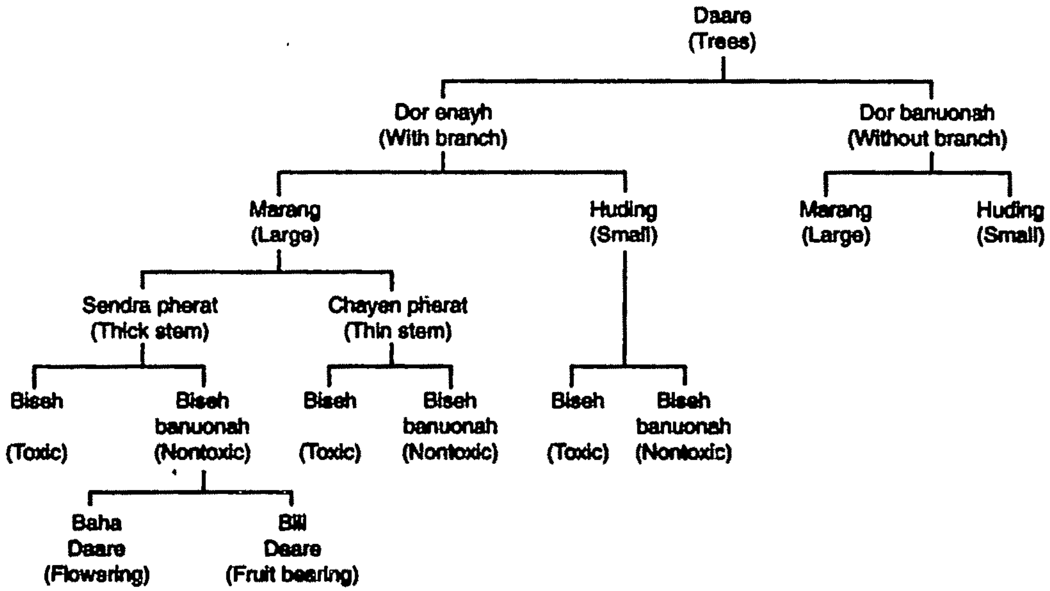


Fig. : 1 Santal Taxonomy of Tree

The figure – 1, portrays that the category *Daare* (trees) have been classified with single contrasting features in different levels. These are in the first level with *Dor enayah (having branches) and Dorbanuonah* (no branches), then in second level with size *Marang* (large) or *Huding* (small). Further according to thickness of stem – *sendra* (thick) or *chayen* (thin). The contrasting set in fourth and fifth sequence of branching related to mode of use, i.e– *biseh* (toxic) or *bisehbanuonah* (non-toxic), *johmako* (edible) or *bakohjom* (non-edible), *bahadaare* (flowering) or *bilidaare* (fruitbearing) etc.

3. Paradigm – Paradigm defines terms on the basis of intersection of features. In semantic paradigm, these characteristics are individual components of features of meaning (Goodenough, 1956). It defines native terms more precisely as well as deals with other forms of relationship. It shows a set of related terms sharing at least one attribute in common and differing from each by at least one attribute.

		SEX			
		MALE		FEMALE	
		Fertile	Non-Fertile	Fertile	Non-Fertile
MATURITY	ADULT	Aadia dangra, Boda, Sukri aadia, Bheda, Sadin	Mundra dangra, Khasi, Sukri badhia, Khasi bheda	Dangri Merom Sukri, Bhedi Sim	Dangri enga Merom enga Bolla enga Bhedi enga Sim enga
	CHILD	Damkom Boda hopon Kudu hopon Bheda hopon Gochot		Panthar Merom hopon Sukri hopon Bhedi hopon Busha	

Fig. 2, Paradigm of Features of Livestock among Santal

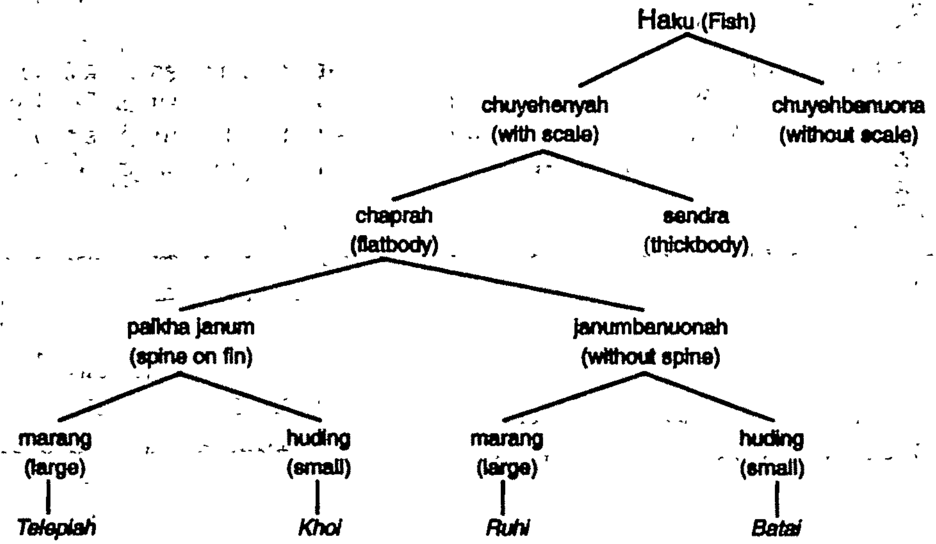
Reading from the figure 2, each term lies at a certain point in the intersection of the semantic components *Jat* (sex), *Ritiau* (maturity), and *Sokra sendek* (fertility). The term *Aadia dangra* can be described paradigmatically as adult fertile male ox of the cow grouping and comparable to *Sukri aadia,* the male fertile pig of the swine grouping while the features adult castrated male intersect at the space containing the label *Sukri badhia.*

Features are paradigmatically arranged when they are multiple and intersecting (Tyler, 1969). In a perfect paradigm all possible combination would be realized, there would be no empty space as a result of incomplete combination.

4. Key – A network based on a series of hierarchically arranged attributes by means of which the identity of a form in question may be determined. Keys allow contrast of a single feature rather than item or term (Tyler, 1969). They are based on a series of choices between alternative attributes, usually present or absent. A positive or negative choice made at any one

juncture in a key leads the identifier along one path only. Ultimately when all appropriate choices have been made, the specimen is identified (Fowler, 1974). Definitions produced through the use of keys would take on the character of attribute lists.

The figure 3, illustrates, a *Telepiah* is a fish with large size, has spine on fin, flat body shape and with scales on body. If the spine on fin is absent the form is a *Ruhi*.



Figure— 3 : Partial key to the Category *Haku* (Fish) of Santal

5. Format Analysis – It is simply one method of stating the data results from controlled eliciting. It differs from other methods in its emphasis on internal consistency, completeness, and form. A particular set of data relating to some semantic domain must be explained by the relationship between units comprising that domain. A format analysis becomes complete when the relations among all the units comprising a semantic domain are described.

Taxonomies, paradigms and keys are different types of semantic arrangements. Of the three taxonomies are mostly used, paradigmatic schemes are less common with domains described by keys having lowest occurence of all. The maximum application of taxonomic schemes may be due to relatively easy application technique and also in part to the general recurrence of this principle of ordering. However, each semantic domain of culture may be ordered by one or more of these arrangements (Tyler, 1969) by ethnographer for presentation of observed and elicited events according to the principles of classification of the people he is studying.

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Communicating Address : Department of Anthropology, Calcutta University,
35 Ballygunge Circular Road. Calcutta—700 019.

Copies are sold at the Calcutta University Publications Sales Counter
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Journal Of The Department Of Anthropology

OLUME : 3 DECEMBER : 1996 NUMBER : 2

UNIVERSITY OF CALCUTTA

JOURNAL OF THE DEPARTMENT OF ANTHROPOLOGY

UNIVERSITY OF CALCUTTA
35, BALLYGUNGE CIRCULAR ROAD
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DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF CALCUTTA
35, BALLYGUNGE CIRCULAR ROAD
CALCUTTA - 700 019

PRINTED BY

CALCUTTA UNIVERSITY PRESS
HAZRA ROAD
CALCUTTA -700 019

VOL. 3 NO. 2

JOURNAL OF THE
DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF CALCUTTA

CALCUTTA
1996

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EDITORIAL

The study of small scale societies was initiated by this department of Anthropology in its early phases of development. The studies on *Purum, Khasi, Korku, Garo, Oraon, Ho, Lodha, Kadir, Chenchu* and *Mahali* created impact in the minds of Anthropologists of following generations. In all these studies ethnographic technique was usually followed. The production and provision of food was mildly touched areas of information. In these small scale societies ways of food getting and food-crop producing dominated where individuals of even tender ages participated in gathering, hunting and cultivation pursuits.

The consideration on gathering and hunting as well as production of food-crops was of importance to these studies as because "food is important simply to sustain biological life". Its essentiality makes the food as a symbol of social life through which the community members communicate with each others. In earlier studies of the small-scale societies of this department as a matter of ethnographic detail hint was made at the food items, preparation of food, rituals concerned with it.

In one of the recent trends of research of this department, study on food is taken into consideration from the point of view of ethnoscience. This research trend indicates at various constrains like ecological and environmental factors which allow possible range of potential food. The cognition of people in making distinction of food and hierarchical classification of the food and non food divide from possible range of alternative edibles is considered as the main task of understanding folk food choice and indigenous food resource.

Gradually nutritional anthropology, folk taxonomy of food, choice and definition of food from range of available plant and animal species are inducing interest to some recent scholars.

Another recent trend is shaping gradually on the aspects of mentally retardates and Down syndrome population. The scale of study is small but it is encouraging. The Editor likes to request the teachers and anthropologists at large to involve themselves more and more to this area of research. The research in this area may be taken to promote improvement of the mentally retarded persons. The social anthropologists can work on families of a community where mentally retarded persons are treated as handicapped. The need for developing partnership of children. parents and professionals may be emphasised through empirical studies. The public attitudes towards the mentally retarded persons and their parents are the mixture of teasing and contempt as well as ambivalent. The study on the sibling relations in the home of the mentally retarded (now known as differently able person) may fruitfully be carried out. Earlier study of this departmental teacher pointed out that the "families need support from the outside for keeping good sibling relations". The anthropologists can study the aspects of conflicts within the families, between the families and professionals to highlight the fact of need for family councelling and negation of over professionalism.

A teacher of this department initiated studies on the mechanism of communication between researcher and person with intellectual disabilities and their families. Main thrust of research was on intellectually disabled persons and their acceptance to the families, kinsmen, friends and neighbourhood.

Syamalkanti Sengupta

The Incidence of Sex Chromatin and its Relationship with Premenstrual, Menstrual and Menopausal Periods among the Bengalee Females

A. B. DAS CHAUDHURI

Abstract : In epithelial cells of buccal smears percentage frequency of Sex chromatin positive nuclei among 115 normal Bengalee females aged 6 to 72 years of the city of south Calcutta found to be 33.33 ± 0.43 with a range from 18% to 56%. For the purpose 11500 cells were examined considering 100 cells from buccal smears of each of the individual female. The significant variance ratio i.e. F-test ($F=7.8$, d.f. 2, 112, $p \leq 0.01$) between and within periods indicate that incidence of sex chromatin differs in premensturai, menstrual and menopausal periods of the Bengalee females. The influence of probable female hormone during these periods of life span of female is suggested to be responsible for incidence of sex chromatin.

INTRODUCTION

The sex chromatin was discovered accidentally in mammals. This sex chromatin body, now also known as 'Barr body' was observed in the nuclei of neurons from female cat but not in the nuclei of male (Barr and Bertram, 1949). One year after the discovery of sex chromatin body in the female cat, a similar sex difference was shown to exist in sympathetic ganglion cells from human female individuals (Barr et al., 1950). Subsequently, nuclear sex dimorphism i.e. presence of sex chromatin in female and not in male has been reported by many workers from different tissues of human body including epithelial cells of buccal smears or oral mucosa. Cytological evidence, now, well established the fact that during prophase one of the two X chromosomes appeared to be heteropycnotic i.e. dense and dark staining and this chromosome may be inactive. This inactive X chromosome forms the sex chromatin found in interphase nuclei and is assumed to be late replicating X chromosome which is controlled by X-linked genes (Lyon, 1962; 1972; 1988).

The wide range of variation is observed in the frequency of sex chromatin in the same tissue of normal human females. In the present paper an attempt has been made to determine the incidence of sex chromatin from buccal smears of the Bengalee females and to examine its variability and relationship, if any, with premenstrual, menstrual and menopausal periods in these females.

MATERIALS AND METHODS

In the present work, 100 cells from buccal smears of 115 normal Bengalee females aged 6 to 72 years of the city of South Calcutta were examined for sex chromatin studies. The ages of the subjects were recorded verifying their documented birth certificates. The age of onset of menstrual cycles among the girls and age at menopause among aged females were recorded through interrogation by the help of a female assistant. As all the female subjects included in the study belong to middle and upper class Bengalee families with good education background the information asserted by them considered to be reliable.

The method of Barr (1965) was followed for obtaining sex chromatin from buccal smears. Fuchsin basic was used for staining sex chromatin. One hundred healthy looking nuclei were examined and the number containing sex chromatin positive nuclei was recorded screening the stained slides from each individual subject under oil immersion and 10X ocular of a Binocular Microscope (Labo).

The analysis of variance (ANOVA) was applied to examine variation with respect to incidence of sex chromatin during premenstrual, menstrual and menopausal periods of the Bengalee females.

RESULTS

The percentage frequencies in occurrence of sex chromatin positive nuclei (SCPN) in different age groups in years such as 5-10, 11-20, 21-30, 31-40, 41-60 and 61 above of the Bengalee females were presented in Table 1. A trend in gradual increase in SCPN was observed from lower age group showing highest in 31-40 years and then a gradual decline. In epithelial cells of buccal smears, the average percentage frequency of SCPN among 115 Bengalee females of South Calcutta found to be 33.33 ± 0.43 with a range from 18% to 56%. In Table 2, the percentage frequency of SCPN was grouped in accrodance to premenstrual, menstrual and menopausal periods of the Bengalee females. The females having menstrual period show highest frequency of SCPN (37.10 ± 0.65) while females in premenstrual and menopausal periods show 26.05 ± 0.75 and 34.88 ± 0.93 respectively. Further, the significant variance ratio i.e. F-test (F=7.8, d.f. 2, 112, $p \leq 0.01$) between and within periods indicate that the incidence of sex chromatin differs in premenstrual, menstrual and menopausal periods on the Bengalee females (Table 3).

DISCUSSION

The present study indicates that the frequency of SCPN varies in different age groups and also at premenstrual, menstrual and menopausal periods in normal females. Therefore, question naturally arises regarding the factors to this wide variation of percentage frequency of SCPN in normal females. Of the many factors, hormonal factor may be considered responsible for this wide variation. Generally, the frequency of sex chromatin varies according to the source of specimen, the nature of preparation (sections, smears or whole amount of thin membrane) and depends to a considerable degree on technical quality of the preparation (Barr, 1963). It is reported that low frequency of sex chromatin was found among the patients having hydrocortison treatment (Taylor, A. I., unpublished work). Increased frequency of sex chromatin in monolayer cultures with increase of cell densities was observed (Klinger, 1966). The frequency of sex chromatin was also found to vary with age of females, growth, menstrual condition, use of antibodies, smoking and acidity (Sharma and Kumbnani, 1979).

The present study among the Bengalee females of South Calcutta shows a marked increase in the frequency of SCPN with maturation (puberty) and gradually decreases after menopause. However, low frequency of sex chromatin is found at the onset of mensturation. During life span of a female individual there are several important stages of development when major changes in hormonal level are also taking place (Forest et al., 1976). The gradual increase in gonadotrophic hormone by the pituitary begins approximately at eight years of life (Fishman, 1983; Gyton, 1986). It usually culminates at the period of puberty approximately 11 years onward. Further, increase in estrogen secretion takes place during the first few years of sexual life. The secretion of estrogen pregressively decreases at the end of sexual life i.e. menopausal period which is approximately 45 to 50 years in normal females. A rise of estrogen level from earlier childhood was reported (Brown et al. 1978) and that estrogen level starts to fluctuate, often irregularly, through the time between onset of menstruation and ovulation.

The sex chromatin frequency fluctuation that is found at the onset of menstruation in the normal female in the present study may be explained as due to the probable hormonal fluctuation at this particular stage. The variation in the frequency of sex chromatin of the present study corroborates with that of secretion of estrogen level found at different ages of normal females (Gyton, 1986). Further, the variation in sex chromatin frequency when subjected to analysis of variance taking into consideration female individuals with premenstrual, menstrual and menopausal periods having different hormonal levels, the results indicate that within and between group variation in sex chromatin are highly significant among the Bengalee females. So the females with premenstrual, menstrual and menopausal periods differ in the incidence of sex chromatin. There is marked increase in the frequency of SCPN among females during their life with menstrual period. The decrease among females with menopausal period and low frequency were found among premenstruating females. As mentioned earlier these periods are associated with different levels of sex hormone. The gradual development of the physiological functions along with secretion of female sex hormone during menstrual period may accelerate the frequency of SCPN. On the other hand, during or after menopausal age the physiological functions become weak and then imbalanced secretion of sex hormone along with enzymatic imbalance probably lowers the frequency of SCPN.

The validity of the findings in the present study may be confirmed by simultaneous study of sex chromatin along with estimation of sex hormone in females and further research is necessary to reveal the mechanism involved with regard to the association of sex chromatin and sex hormone.

ACKNOWLEDGEMENT

The study was supported by yearly budgetary research grant (1991-1992) to the faculty member (author) by the University of Calcutta. The author acknowledges the technical assistance provided by Dr. (Mrs.) S. Chakraborty and Mr. J. Bandyopadhyay, Human Genetics Laboratory, Department of Anthropology, University of Calcutta.

Table 1. Percentage frequencies of sex chromatin positive nuclei in different age groups of the Bengalee females

Age groups (in years)	No. of individuals studied	No. of cells examined	No. of sex chromatin positive nuclei observed	Range	Frequency of sex chromatin in percentage
5-10	34	3400	886	18-31	26.05 ± 0.75
11-20	15	1500	390	21-35	26.00 ± 1.13
21-30	31	3100	1252	33-51	40.38 ± 0.88
31-40	9	900	399	35-56	44.33 ± 1.65
41-60	18	1800	691	32-47	38.38 ± 1.14
61- above	8	800	216	20-31	27.00 ± 1.56
All ages	115	11500	3834	18-56	33.33 ± 0.43

Table 2. Percentage frequencies of sex chromatin positive nuclei at premenstrual, menstrual and menopausal periods of the Bengalee females

Periods	No. of individuals studied	No. of cells examined	No. of sex chromatin positive nuclei observed	Range	Frequency of sex chromatin in percentage
Premenstrual (5-12 yrs.)	34	3400	886	18-31	26.05 ± 0.75
Menstrual (13-45yrs.)	55	5500	2041	21-56	37.10 ± 0.65
Menopausal (45- above)	26	2600	907	20-47	34.88 ± 0.93

Table 3. Analysis of variance (ANOVA) on the data of sex chromatin of the three periods in the Bengalee females

Source of variation	D. F.	Sum of square	Mean square	F ratio
Between periods	2	0.2645	0.1322	24.48*
Within periods	112	0.6059	0.0054	

*$p \leq 0.01$

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Santar Concept of Colour Categories and Food Taste

SYAMALKANTI SENGUPTA AND SOMA BANDYOPADHYAY

Abstract :

Key words : Environment, *Daare* (tree), *Hasa* (soil), *Chroma*, *Sakam* (leaf), *Daria* and *Etang*.

The *Santar* living in close proximity to natural environment connect their intimate relations with four domains: *Jib-jiyeli* (animal), *Chede-chipru* (bird), *Daare* (tree) and *Hasa* (soil). The perception of the former three domains comes from the visibility of *Rohoy* (domesticated) and *Bir* (wild) varieties This visibility of domain gets chromatic expression. The colour perceptuality of the *Santar* takes shape from their intense dependence on *Hasa* and *Daare* for living. Ecologically they are familiar to various shades of colour from *Sakam* (leaf) and body parts of the plants as well as *Hasa* and other ingredients added or found in it. Four parts of a tree the folk brings into their regular sight for recognising *Chroma* of the colour. The *Sakam*, *Bili* (ripe fruit) and Jaw (unripe fruit), *Baha* (flower) and *Dali* (stem) were used by the *Santar* to identify the colour spectrum. The basic colour lexicon of *Santar* consists of five basic terms : *Punde*, *Hende*, *Arah*, *Hariar* and *Sasang*. All these colours were expressed in two contrasts : *Daria* and *Etang*.

PERSPECTIVE OF COLOUR PERCEPTION

All cultures try to set an order to the various reality in which they live, by categorising their environments. The Nature in fact presents a continuum of infinite gradation between phenomena and in the spectrum of coloured light. Every culture treats the spectrum of coloured light as a set of discrete entities. The number and exact identity of the colour recognition, varies from culture to culture, which have an important relation to environmental adaptation (Berlin and Kay, 1970).

In order to understand this preface empirically the authors carried out field-works in different villages located in East Singbhum district of Bihar state. The ethnographic field techniques were usefully utilized in the study of lexical sets to unveil the perceptual categories specially in understanding of the folk system of colour categorization. Certain critical questions relating to colour vision can be answered definitely only through the use of anthropological data (Kay, 1952 : 251). The ethnographic techniques were used among the *Santar* (Eng. Santal) as the people called themselves inhabiting in the villages like Digri, Dhatkidih and Mahalidih which reflected the unitary trend in colour categorization. The *Santar* system of colour perceptuality intimately depend on Chromatic differences in the appearance of *Baha* (flower), *Bili* (ripe fruit), *Jaw* (unripe fruit), *Dali* (stem) and *Sakam* (leaf). These they used in folk taxonomy and classification of *Daare* (plant) (Sengupta and Bandyopadhyay, 1996) Moreover, the *Santar* were well related to the *Oth* (land) as cultivators of stapple food crop or *Huru* (paddy) and *Budgay* (kitchen garden) products. The land contained different kinds of *Hasa* (soil) which the folk used for various domestic purposes. The *Hasa* was classified in terms of colour. It indicated different hue.

The colour vocabularies of the *Santar* firmly established that the meaning of a word should be understood in its own term without hinting at a priori theories of "Semantic Universals" (Berlin and Kay, 1969 : 1). It is true that in vocabulary of colour classification, methodological treatment brings the anthropologists very often into agreement against the existence of "Semantic Universals". But further research on the domain of colour vocabulary pointed out that "Semantic Universals" do exist.

BASIC COLOUR TERMS AND METHODS

There are eleven basic colour categories in English : white, black, red, green, yellow, blue, brown, purple, pink, orange and grey. The *Santar* encoded in their vocabularies a few number of colour categories (five) than eleven basic categories. Thus it exhibited strict limitations on categories they encoded.

Number of basic colour terms	Perceptual categories encoded in the basic colour terms by the *Santar.*					
	Punde	*Hende*	*Arah*	*Hariar*	*Sasang*	
	(white)	(black)	(red)	(green)	(yellow)	(blue)
5	+	+	+	+	+	–
	(brown)	(purple)	(pink)	(orange)	(grey)	
	–	–	–	–	–	

Fig. 1. The actual occuring type of basic colour lexicon of the *Santar.*

To explore the concept of colour among the *Santar*, the authors applied several methods of cognitive anthropology within the semantic domain. Standard colour stimuli were used in conducting the field study by the authors. These consisted of 48 colour cards prepared out of "Camel Oil-pastel" of 48 shades as well as 42 shades presented in "Berger Paints" colour indication. The cards were numbered in the back side. The data were gathered in two stages : (1) The basic colour words in Santali dialect were elicited from thrity-four key informants and (2) Each informant was asked to categorise the different shades as per saturation or intencity (chroma) and brightness or brilliance (value). In culling data on colours, the "Camel Oil-pastel" cards and "Berger shade cards" were introduced separately. The cards were presented to the informant in a wholly random fashion. If the cards serially presented would have elicited many incorrect responses due to carry over of impressions (Kay, 1952 : 256).

While dealing with the concept of colour the authors related the perceptual environment, effective environment and the total reality of environment into consideration. The environment which the *Santar* perceived in terms of resource availability was the perceptual environment. Elements of environment which effectively influenced them were the contents of effective environment and the environment composed of fundamental, non-experienced realities was called as the total reality of environment. The *Santar* world or *Disham* is the basic reality which contains *Oth* (land), *Jib-jiyeli* (living organisms) *Daare* (plant), *Gendre* (river), *Buru* (hill) and so on.

The languages of the *Santar* had indefinite series of expressions which were formed from the visibility of plants, lands, animals and birds of a given environment. The expressions *Arah* (red) *Punde* (white), *Hende* (black) and *Sasang* (yellow) denoted the sensation of colour terms from *Hasa* (soil). Regarding different basic colour terms, the researchers observed that the languages possessing a few basic colour terms were invariably spoken by them who had relatively limited levels of economic and technological development. On the contrary, languages with full colour lexicons were usually spoken in the more complex societies. It can be argued that abstract colour terms are relatively unimportant concepts in societies close to nature and that numerous and highly specific distinctions of meaning are more important to encode colour linguistically in such groups.

MEANING OF COLOUR

In Santali dialect colour has got a distinguished term as *Rong*, though colour in western technical sense, is not a universal concept in many languages (Conklin, 1962). Each colour term of the *Santar* expressed in two contrasts *Daria* and *Etang* indicating relative darkness/deepness and relative lightness respectively.

The spectrum is a continuum of light waves. The different cultures organise the sensation of spectrum for communication and show some strange differences (Bohannan, 1963 : 35-36). Krauss (1968 : 268-269) used speakers of different languages who sliced up the perceptual world differently according to the availability of slices in their languages. The names used for colour often indicated the sources from which pigments came, the value placed upon colour and pigments. There were several expressions of the *Santar* folk which appeared as descriptive. Each of these expressions was drawn from the natural object, with addition of a prefix or suffix. Thus, *Sakam* (leaf) *Rong* indicated the expression of green as a descriptive phrase and not as a basic colour term. The *Bale Sakam* (tender leaf) *Rong* was the expression of green colour indicating light shade. The *Santar* spoke of colour categories of a given lexicon which referred to the meaning of folk lexemes in terms of three dimensions : hue, saturation and brightness (Conklin, 1955). The *Santar* colour terms demonstrated the colour lexemes into succulence (*Berel*) versus desiccation (*Rohor*).

THE CULTURAL SIGNIFICANCE

The treatment of various colour terminologies presented in this paper to appreciate the cultural significance of colour words, the authors tried to unveil the meaning, both in referential and connotative terms beyond the dimensions of hue, saturation and brightness.

Prelude to the discussion of cultural significance on colour categories of the *Santar* two points were considered : (1) technical literature defined colour as the evaluation of the visual sense of the quality of light determined basically by its spectrual composition and (2) the spectrum was the range of visible colour in light measured in wavelengths (Conklin, 1955). The *Santar* colour terms were parts of vocabulary of particular languages and intracultural analysis of such lexical sets and correlates which could provide the key to their understanding and range of applicability.

The *Santar* colour classification were recorded through *visual-quality* attributes taken from description of specific items of natural and artificial surroundings. The *visible-quality* of one substance (plant part or colour card) was related to and contrasted with that of another to denote a particular colour perception. *Hasa* (soil) was one of the elements of effective environment of the folk. It was noted fact that almost all the basic colours, people perceived indicating different types of *Hasa* (soil) of different composition and use. Four important basic colours such as white, red, black, yellow were identified in relation to *Hasa*. The *Santar* conceptualized red as the colour of *Arah hasa* (red soil) which they used mainly to smear over the *Kandh* (wall) of their *Orah* (house). Similarly white, black and yellow were also perceived as the colour of *Punde hasa* (white soil), *Hende hasa* (black soil) and *Sasang hasa* (yellow soil) in their visible attributes. When different shades of these basic colours were shown people differentiated them and in most of the cases they tried to visualize the similarity of the shades with any kind of *Hasa* available in their surroundings (Fig. 2). Not only the basic colours but some derivatives were perceived in relation to *Hasa*. Brownish colour was identified as *Hasa leka Rong* which meant the colour was like that of earth. To express the body colour of a bullock, people used the term *Hasa dangra* (a light coloured bullock).

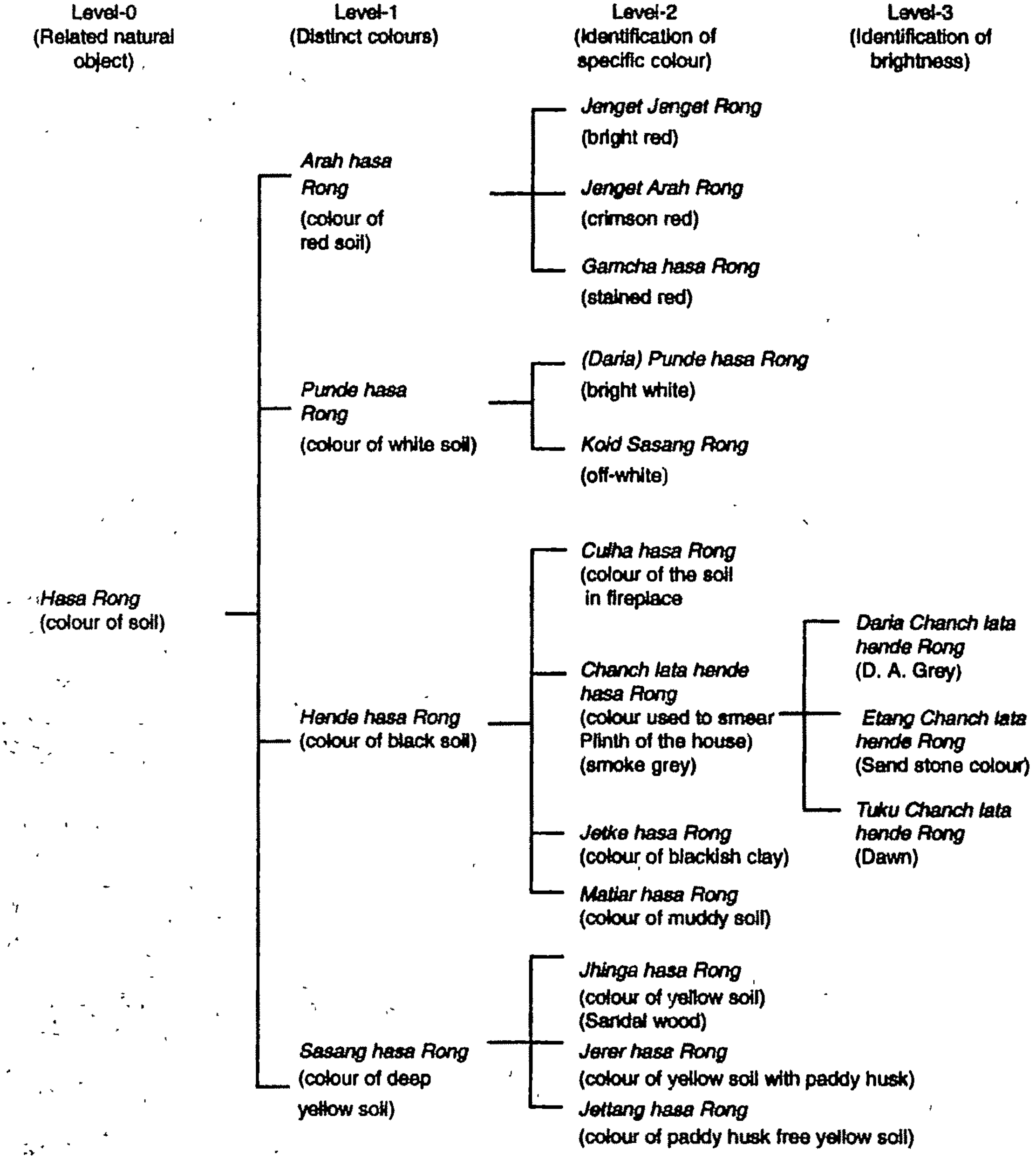
Level-0 (Related natural object)
Level-1 (Distinct colours)
Level-2 (Identification of specific colour)
Level-3 (Identification of brightness)
Hasa Rong (colour of soil)
Arah hasa Rong (colour of red soil)
Jenget Jenget Rong (bright red)
Jenget Arah Rong (crimson red)
Gamcha hasa Rong (stained red)
Punde hasa Rong (colour of white soil)
(Daria) Punde hasa Rong (bright white)
Koid Sasang Rong (off-white)
Hende hasa Rong (colour of black soil)
Culha hasa Rong (colour of the soil in fireplace)
Chanch lata hende hasa Rong (colour used to smear Plinth of the house) (smoke grey)
Daria Chanch lata hende Rong (D. A. Grey)
Etang Chanch lata hende Rong (Sand stone colour)
Tuku Chanch lata hende Rong (Dawn)
Jetke hasa Rong (colour of blackish clay)
Matiar hasa Rong (colour of muddy soil)
Sasang hasa Rong (colour of deep yellow soil)
Jhinga hasa Rong (colour of yellow soil) (Sandal wood)
Jerer hasa Rong (colour of yellow soil with paddy husk)
Jettang hasa Rong (colour of paddy husk free yellow soil)

Fig. 2. Categorization of basic colour terms related to *Hasa* (soil)

Colour of dry soil is designated as *Rohor hasa Rong.* This pattern of categorization reveals the fact that people's concept of colour derived from the matrix of *Hasa* (soil).

Hasa Rong was further categorised in four levels. Level-zero was meant for the natural object which was categorised, i.e. *Hasa Rong* (soil colour) in this case. In Level-1 distinct colours which were nothing but identified colour of different types of *Hasa.* In Level-2 specific identified colours were hierarchically classified depending upon their brightness. Berger paints indication of colours and colour terms were given in bracket. In Level-3 specific colours were further hierarchically classified to express the *Santar* perception of distinct *hue* of a particular colour.

It has clearly been mentioned that in most of the cases different colours had been identified depending upon the saturation or intensity (chroma) of colour. Each colour was identified into *Daria* (deep/dark) and *Etang* (light) shades which proved that linguistic parlance allowed the people to express their concept of intensity of colour, into their cognition.

Another important basic colour found among the *Santar* was green. People used a specific term *Hariar* to distinguish the green colour. The *Santar* informants sensitized essentially some maximal extension of *Hariar* (green) colour. The plant parts were extensively used to denote shades and sensation of colour categories. Descriptive phrases were often utilised, for example *Puroi bili Rong* (colour of ripe fruit of *Bassela* sp.) indicating violet colour card.

To identify different shades of green colour people took help from several green elements specially *Sakam* (leaf) present in their reality or perceptual environment. First of all they categorised two shades of green not in terms of intensity but in terms of brightness (value).They distinguished bright dark green colour as *Berel Sakam* (fresh leaf) *Rong* and light shade of green as *Bale Sakam* (tender leaf) *Rong.* Besides they categorized different shades with special reference to their similarity with different leaves found in their locality. To express the tendency of a particular shade nearer to an identified shade people used the terms *Katij* (less), *Koid* (little), *Tuku Tuku* (lesser and lesser) and so on indicating the nature of saturation of a colour with reference to basic colour term-*Hariar.* The *Santar* identified a particular shade of green as *Sealom* (algae) which could be considered as a distinct category of *Hariar* (green)

The domain of *Hariar* (green) can be categorised (Fig. 3) in three different levels. Level-zero is meant for the basic colour term *Hariar.* In Level-1, various shades have been hierarchically classified with special reference to their intensity (chroma). The *Santar* could categorise shades of green colour out of 21 shades of green supplied by the authors. They identified 6 specific shades according to their hue of which 5 shades were identified in terms of their similarities with natural objects hinting at different conditions of leaves. But they could arrange those shades hierarchically depending upon their quality of intensity : *Daria* (dark) and *Etang* (light). In the level of specific colour identification also the aspects of *Daria* and *Etang* had been considered. The Bus green shade has been identified as the darkest and the Tata Mim as the lightest. Intermediate shades were relatively arranged according to their intensity.

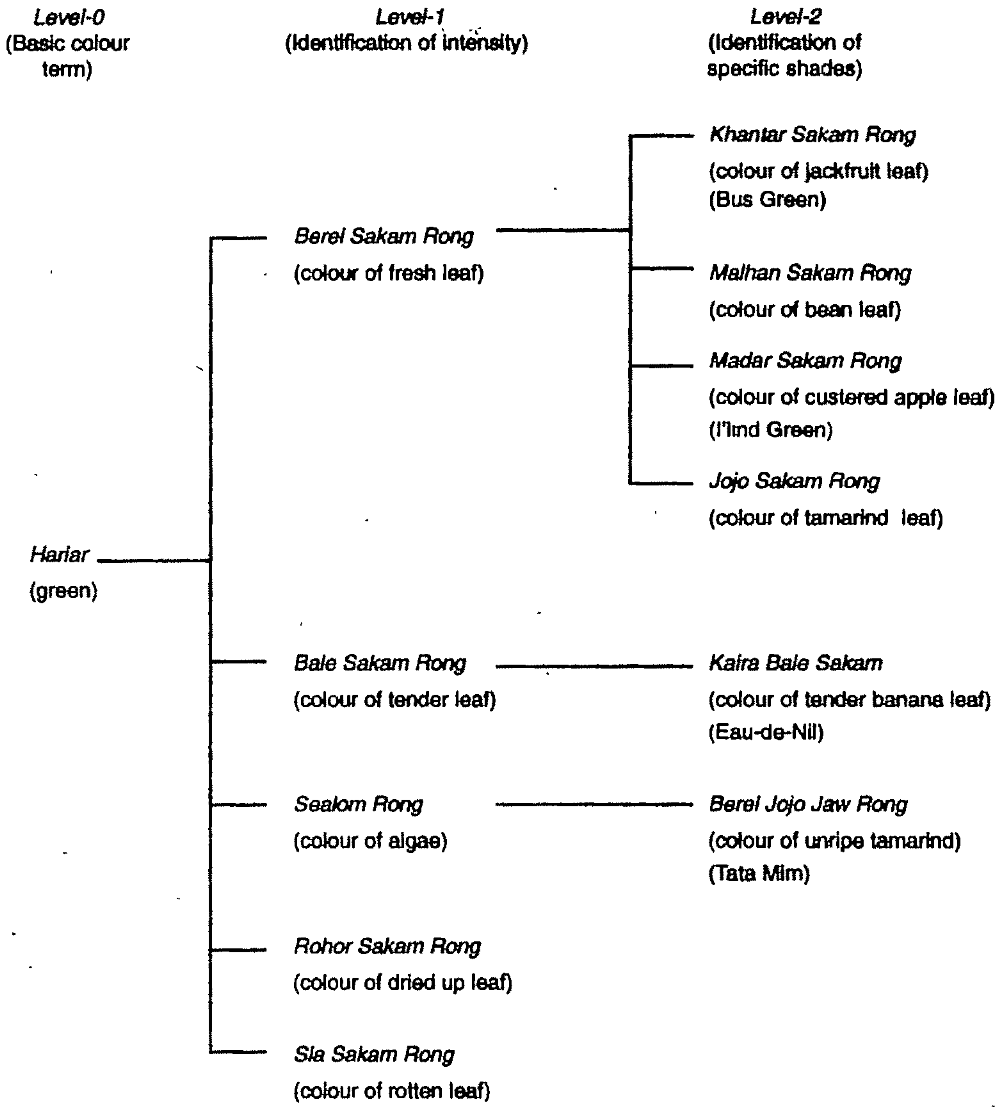

Fig. 3. Categorization of *Harlar* colour.

CATEGORIES OF MIXED COLOUR

Next comes the categorization of mixed colour. The *Santar* identified any thing with mixed colour as *Khudia* and distinguished the variety of *Khudia* depending upon the dominance of a basic colour. This concept was probed into, with the help of *Sim* (hen) and *Sandi* (cock). Hence *Khudia Sim* was shown as a variety of hen which had feathers with many coloured spots mainly on black feathers. Similarly *Punde Khudia* was indicated to mixed colour having white colour as dominant. When people failed to discriminate the dominant basic colour from a mixed one, they termed it as *Barobunia Khudia*. Not only in case of mixture of contrasting colour but mixture of similar colours as well as combination of closely related shades were also distinguished by the *Santar. Hariar-Sasang Rong* was pointed out as the combination of green and yellow colour with greater intensity of green. *Sasang-Arah Rong* was the combination of yellow and red where saturation of yellow was greater than red. Even in the case of combination people were inclined to conceptualize dark and light shades. They identify them in descriptive terms. Two shades were identified such as *Hariar-Sasang Rong* meaning greenish yellow colour. But the lighter shade was easily distinguished in descriptive term as *Ona Khona Aro Etang* (B is lighter than A). In some cases conception of light and dark was recognised in descriptive parlance of visible attribute. Dark green colour in a way of identification got higher intensity of black colour accordingly the *Santar* pointed out it as *Hende* (black) *Rong*.

IDENTIFICATION OF SHADES

So far as the discrete identification of the spectrum is concerned, again incidence of common elements are coming out. Violet was identified as *Pruoi billi Rong* (colour of ripe fruit of *Bassela* sp.), Indigo as *Daria lil* (dark blue), Blue as *Serma lil* (sky blue), Green as *Malhan sakam Rong* (colour of *Dolichos lablab* leaf), Yellow as *Sasang*, Orange as *Arah-sasang* (combination of red and yellow) and Red as *Daria Jaba baha Arah* (deep red shade of *Hibiscus* flower).

In those cases where people failed to distinguish the intensity of colour, they tried to identity the shades with the help of those things which acted as necessary resources for their life. Different shades when shown of violet colour they were identified as the colour of different fruits or flowers as no separate term exists. Data revealed that the *Santar* had concept about the violet colour itself but no colour term existed which proved that violet had *Etang* (little) visibility in their surroundings. Finally, the most of the light shades of violet colour was conceptualized as *Gamcha hasa Rong* (stained red colour).

Fig. 4 represents categorisation of violet colour into different shades. People failed to distinguish the chroma but here the shades identified with the help of common examples to indicate the brightness (value) of the colour in the manner of 1> 2> 3> 4> 5> 6. The *Santar* acquired the idea from the nature to distinguish the transformation or change of the shade of a particular colour from succulence to desiccation. They identified the succulent leaf as *Bale* (tender) *Sakam* and *Berel* (fresh) *Sakam*. The *Sakam* gradually turned into *Sasang* (yellow) and become *Rohor* (dry). Sometimes the transformed *Sasang Sakam* in damp climate became *Sia (rotten) Sakam*. Similarly red chilly was identified into two colour contrasts on the basis of its *Raka* (fresh) and *Rohor* (dry) conditions. They expressed the saturation of *Raka* red chilly as *Arah* (red) *Marich Rong*, but some other shade of violet colour was identified as *Rohor Marich*

Arah Rong (colour of dried up red chilly). White was identified as *Punde* but off white as *Koid Sasang* (to some extent yellow).

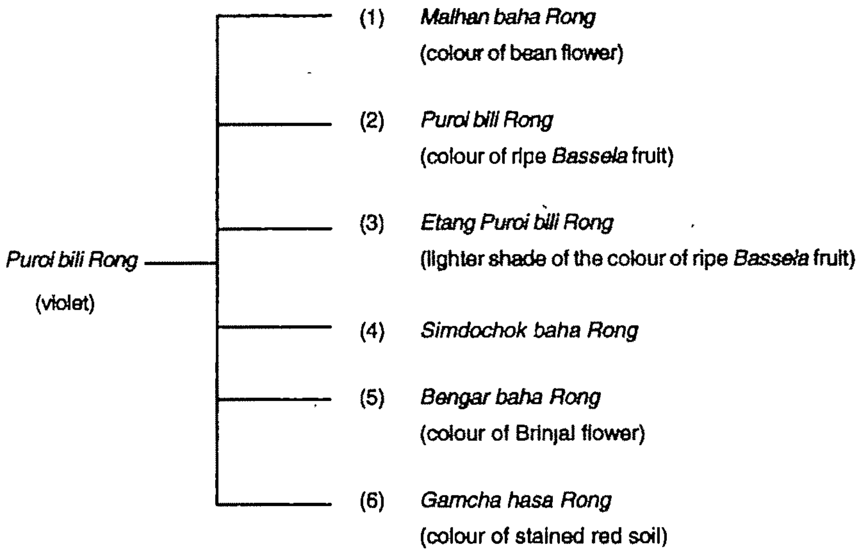
Puroi bili Rong
(violet)
(1) *Malhan baha Rong*
(colour of bean flower)
(2) *Puroi bili Rong*
(colour of ripe *Bassela* fruit)
(3) *Etang Puroi bili Rong*
(lighter shade of the colour of ripe *Bassela* fruit)
(4) *Simdochok baha Rong*
(5) *Bengar baha Rong*
(colour of Brinjal flower)
(6) *Gamcha hasa Rong*
(colour of stained red soil)

Fig. 4. Categorization of violet perception into different shades.

The facts proved that the folk always had a tendency to visualize different shades of a particular colour with reference to basic colour and visual attributes. It appeared from the whole set of categorization of colours the *Santar* made an attempt to provide a continuous series of vocabularies to identify colour shades. But the efforts to indicate the brightness or luminosity and saturation were often confused with hue and they were subjective (Ray, 1952)

CATEGORIZATION OF FOOD TASTE

The data on food taste revealed the fact that though the taste varied from subject to subject but it exhibited similar kind of perception indicating cultural recognition of food conditions. The *Santar* use the term *Joma* to mean food. They identified three conditions of *Joma* in terms of its nature: Such as *Raka Joma* (fresh food), *Baske Joma* (not fresh) and *Sia Joma* (rotten food). Of these three conditions both *Raka Joma* and *Baske Joma* were considered edible where as *Sia Joma* was thoroughly rejected, because of its attribute for inducing physical indisposition.

The *Santar* informants claimed that these three conditions of food were intertwined within a distinct concept of *Sebel* (taste) which have the configuration of food taste network from emic point of view. Thus the authors got the privilege of understanding basic *Sebel* varieties of six types, (Fig. 5).

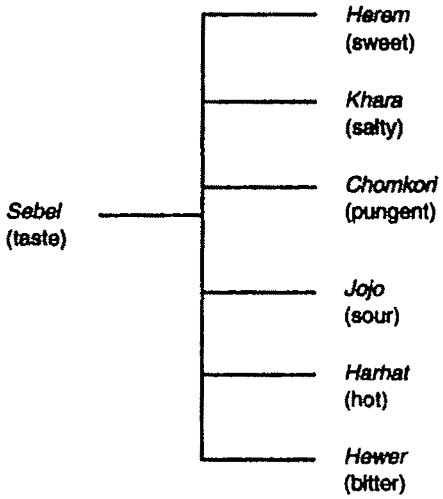

Fig. 5. The *Santar Sebel* categories.

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Petrological Analysis of Tools and Their Raw Materials from Two Sites in Northern Orissa

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Abstract : The present paper contains the petrological analysis of tools and raw materials from the two sites of Northern Orissa, India.

INTRODUCTION

Tools are important components for palaeoanthropological studies. Major part of the evidences of earlyman on earth is in the form of stone tools. Typo-technological studies of the stone tools has shown diversity and progressive development through time and space (Burkitt, 1962; Sankalia, 1964; Bordes, 1968). Types of stone used for manufacturing of tools varied from place to place and from time to time (Washburn, 1959). Quartzite, flint are some of the rock types commonly used for making tools. In India the former is the main material for lower palaeolithic tools. In South Asia, man used quartzite and other rocks, collecting them from the pebble beds of river banks because chalk flint or flint or other formations were rarely found in open exposures. According to Sankalia (1964), early man preferred quartzite, one of the oldest rocks, wherever it was available. But in the Deccan Plateau of Maharastra, this formation is covered by the masses of lava called basalt or trap. So man was forced to use basalt as raw material from dolerite, which occurs as intrusive dykes in the basalt. Very often one would find a large number of tools and their debris near Navasa and Ganga out at Nasik, Maharastra. It is often noted that with technological development rock types also changed. Quartzite was replaced with flint, chert etc. during Middle Palaeolithic time. With the advent of grinding and polishing technology harder rock types evolved (Sankalia, 1964; Semenov, 1964). It appears that from the very beginning of toolmaking man had recognised the suitability of cleavage planes of stones for making tools (Flint implements, 1956; Oakley, 1956; Braidwood, 1964). Biological preconditioning played a role in cultural capability (Buettener Janusch, 1965; Montagu, 1951; Campbell, 1967).Selectivity of raw matenal depended much on the development of these factors.

For the proper understanding of the raw material and its relationship with cultural selectivity the present work had been carried out at two sites in Northern Orissa. They are, Jamara near pallahara town and Kuanar near Kanjipani.

Jamara is situated in Angul district of Orissa. It is a palaeolithic site. Kuanar is a neolithic-chalcolithic site and located in Keonjhor district of Orissa. The main aim of this work is to understand the types of rocks used by the prehistoric men for the manufacture of tools. An enquiry into the source of raw material was made by picking up rocks with which the tools were associated. The selection was rather random though the authors tried to keep system in collecting materials. The tools which were similar to the stone fragments were mainly collected for the present study. The purpose of such work is to establish (a) a close relationship between raw materials and tool typologies, (b) a sequence of development of technology from cruder to finer related to the use of coarser to finer type of raw material, (c) a close link between the typo-technology and rock types and (d) finally to understand how far the bio-cultural process of man was related to the selectivity of rock types for manufacturing the stone tools.

METHODOLOGY

In the field, exploration and trial digging were carried out by the present authors. The site Jamara is laden with tools and raw materials. Both extensive and intensive exploration was done by the authors. Many *insitu* tools were found from gravel bed. The site Kuanar has yielded large quantity of celts, tools and chips. Study had been made of the tools collected by grid method and by trial digging. Samples of both tools and rock fragments were sent to the Department of Geology, Calcutta University for Petrological analysis. The Selection of the tools and rocks was made on the basis of association. Ground sections of those materials were made and slides were prepared from those sections for the study. The photographs of those sections were also taken for precise analysis.

SITES AND STRATIGRAPHY

Jamara : The site is located within 21° 25' NL and 86° 16' EL. Contour line of this site is 200 metre. It is surrounded by the Malayagiri Hill range on Northern and Southern sides. Chhonuri hill, an extension of the Malayagiri range stands at the back of the site. Eastern side is comparatively low with paddy field and land drastically falls down to 160 metre contour line. Gravels are strewn on the surface of the site. At the time of exploration semiround angular gravels were seen together with the rolled gravels. Tools were found lying mixed with gravels.

Stratigraphy was studied from both naturally exposed sections and trial trenches. There are exposures along the stream beds and along the eroded edge of the table land. A gravel bed about 30 cm. in thickness was found at the base of the section. Gravels are large, cemented and well sorted. A silt bed of 45 cm. in thickness, reddish in colour and coarse in texture is noted on the top of the lower gravel bed of 20 cm. thickness. These gravels are small, loose and angular in shape. The top most bed is silt and 65 cm. thick. The colour of this silt is coarse. Vegetation has grown on top of this upper silt bed. Three trial trenches were dug out at various places.

Kuanar : This is located between 21° 31' NL and 85° 28' EL. Area is hilly within 60 metre of contour line. The site is on a mound. The mound is about 30 metre in length and about 12 metre in breadth. This site is situated on the right bank of the tributory of Ghumura river which in its turn meets with the river Baitarani. A number of runnels are found on the northern side of the mound. Tools and raw materials are procured from the red soil where the top soil had been eroded. The surface is strewn with chips, celts, blades, scrapers, flakes and potsherds. The chips are both tools and waste flakes. The top of the mound is covered by shurbs.

Stratigraphy at this site is not much different from what observed at other Neo-chalcolithic sites in Eastern Plateau region (Ghosh *et al*, 1984). The red coloured deposit is recent in origin and belongs to Holocene. Tools are collected from this deposit.

STONE TOOLS, RAW MATERIALS AND TECHNOLOGY

From Jamara a large number of Palaeolithic tools were collected from both the surface as well as from the trial trenches.Total number of 434 tools were collected from this site. The main types were chopper, handaxe, cleaver, scraper, knife, point and flakes. Assemblage pattern belongs to Acheulian tradition, with distinct mark of transition towards Middle Palaeolithic stage. Scraper dominated the tool kit. Main technology for flake was Levalloisian. Core tools were prepared by controlled flaking method, similar to Acheulian tradition.

From Kuanar huge quantity of celts, blades, points, scrapers, fluted cores, awl, lunate and wastage flakes were found. One mortar and pestle were also collected. The Total number of tools collected from both the surface as well as from the trenches were 656. Large quantity of wastage flakes as well as good amount of unfinished tools suggest the site to be a factory site. Presence of mortar and pestle, celts, potsherds indicate that the site was used for habitation also. Tools were manufactured by chipping, pecking, grinding and polishing methods. The last method is not so much visible. There is a process of selectivity reflected in the use of raw materials. Stones were selected carefully by early man in every stage of cultural development.

The palaeolithic tools selected for present study were made from Quartzite. Quartzite is a silicified sand stone. Colour is light grey, almost white. Different impurities give this stone red, violet, cherry, greenish and other tints. It has dull, glassy lustre and rough conchoildal fracture. Fracture surface is granular, slightly lumpy, rough to touch. Based on the compactness of grain structure, it was revealed that three categories could be detected. One, very fine grained type, second, a medium grined type and third, less fine grained (Read and Watson, 1962). The present study shows that selectivity was found in types of quartzite. Only good varieties were utilised by palaeolithic men for making their tools.

The tools collected from Kuanar were all made from the basalt. Basalt is young magnetic rock and does not contain quartz. The colour of such type of rock is black or dark grey. Basic constituent of such rock is felsper. It has compact and fine grained structure. Dull sheen is found on it. Fracture is rough and uneven in nature (Read and Watson, 1962). During the New stone age, prehistoric men in India preferred such type of rock for making ground and polished celts, axes, adzes, mortar and pestle etc. (Worman 1949; Sankalia, 1964).

PETROLOGICAL ANALYSIS

For the present work both stone tools and possible source of raw material were selected for petrological analysis. Petrological analysis of the raw materials and tools give us a good information about the selective capacity of the early man. When broken the materials showed a difference of colour between the internal part and external part. That was due to patination. The tools which were collected from Jamara were all quartzite tools. Though basalt was readily available in the form of pebbles and gravels in Orissa, prehistoric man did not choose that rock for the manufacture of tools until they reached the neolithic stage with its specific technology. Most probably basalt was not suitable for making palaeolithic tools in the region. Several palaeolithic tools collected from Jamara had been subjected to petrological analysis. Description of the slides for each tool is given below. All the tools are from stratified context.

PALAEOLITHIC TOOLS FROM JAMARA

1. JMR – DH / 90 E 2' – 3' — This is a handaxe of lower palaeolithic stage and found from the lower part of upper gravel bed. It is made on fine grained quartzite. The component of

such kind of rock is quartz. Quartz grains are highly deformed into prominently elongated grains. Schistosity is very pronounced. The raw material appeared to be less suitable for tool making. Schistosity, however, renders uneven cleavage, thereby it becomes quite difficult to get flake scar. Accessory minerals are rare.

2. JMR / DH / 90 7SS — It is a discoidal scraper, made on very fine grained cherty quartzite. Conspicuous schistosity is present. Metamorphism produced schists. These schists possess well-defined foliated or leaflike appearance which is called as schistose structure. A band occurs parallel to the schistosity. This rock appears to be suitable for tool manufacture but the schistosity and bands do not always give desired cleavage.

3. JMR / DH / 90 11SS — It is a side scraper found from the highest part of the upper-gravel bed. This is a middle palaeolithic tool, quite fine, grained and was identified as cherty quartzite. Grains are slightly elongated with serrated outline and showing interlocking texture. Streaks of opaque minerals with prominent elongation have parallel alignments and thus give rise to a conspicuous schistosity. Zircon is present as rare constituent. Inspite of the schistosity the rock appears to be quite a good material for tool manufacture. This is due to its interlocking, elongated chain like grains.

Two pieces of rocks were selected for analysis in the laboratory. Selection is rather random. They were lying very near to the tools on the surface at Jamara and had an apparent resemblance with rock types of tools.

ROCK MATERIALS FROM JAMARA

(a) JMR – 92 — It is partly a rolled piece of rock very common at the site of Jamara. The rock is quartzite but it has got reddish brown stain due to leaching of iron solution. This is rich in opaque minerals. Due to the grain size, such kind of rock was comparatively less suitable for the manufacture of tools.

(b) JMR – 93 — This is fine grained quartzite with laminar structure. Character of this rock is very much similar to JMR – 92. It was too hard to knock off the flakes and get desired sharp working end. Perhaps for these reasons the palaeolithic man did not use these rocks for tool making purposes.

NEOLITHIC TOOLS FROM KUANAR

In the present study all the tools collected from Kuanar are made from basalt. The tools and raw materials on basalt are all more or less fine grained to medium grained. Opaque minerals are abundant. Plagioclase laths form triangles, interstices being filled up by pyroxene with the development of intergranular texture. Most of the basalt rocks are very altered. Fresh basalt are not suitable for grinding. The tool makers identified this altered basalt which was ideal for grinding polishing technology. Cleavage planes are different from chert.

A brief description about the grain structure and minerals of two tools and a fragment of rock are given below for the purpose of petrological study.

STONE TOOLS

(1) Kn – Kg – 93 — It is a butt end of a celt. It was made by chipping and grinding. Grinding is pronounced on dorsal surface and pecking is found along the periphery. The rock is medium grained basalt and partly altered.

(2) Kn – Kg – 93 Sq – 94 — This is a side scraper made on thick flake having a sharp working edge. The section of this tool shows that it is also a medium grained basalt and partly altered.

(3) Kn – Kg – 93 35 — This is just a rock fragment showing two flake scars probably collected as a raw material by the prehistoric man but discarded due to its unsuitability for manufacture of tools. This rock is coarse grained basaltic rock and very altered.

The above mentioned tools are made on medium grained basalt. None of them is dolerite. The stones are partly altered so that it had become suitable for manufacturing of celt. This kind of raw material had not been used earlier in mesolithic or palaeolithic stages. As far as conchoidal fracture is concerned this raw meterial is not ideal for tool making. In other words, in terms of palaeolithic and mesolithic technologies, this raw material would rather be considered as second best material for tool making. The plain of fracture of those tools and the compaction of grains are such that the breakage of the working edge is less. Whenever it becomes blunt it could be resharpened. It was also a tough rock for making heavy tools like celt, mortar and pestle, axe and adze. Within basalt they selected not all the varieties but slightly altered types. Even the present day stone workers prefer the altered varieties for grinding out stone vases or bowls in the area.

DISCUSSION

It may be inferred from the above noted description that the stone age people were quite selective regarding the suitability of rock for making tools. Probably he experimented with rocks for the manufacture of tools. It is evident from the profuse waste flakes and unfinished tools found at Kuanar. Perhaps through time they accumulated knowledge for recognition of the suitable rocks. Their own experiences regarding cleavage plane of rocks and the breakage giving rise to a sharp cutting edge were related to the techno-typological development throughout stone age.

Availablility of rock was an important factor. With the development of technologies raw materials were changed. Manufacturing of stone tool depends upon the texture of the stone. Certain special techniques are related to the special stone. The wastage will be less if the grain size is uniform and the fracture will also be regular. Though plenty of rock fragments were available at Jamara yet they chose only the rocks having specific grain structure and schistosity related to cleavage pattern. It is apparent from the present work that the Acheulean tool was made on quartzite but there was a definite change from coarser to finer quartzite, i.e., quartizite to cherty quartzite through lower to middle palaeolithic stages. The grinding and polishing technique brought about completely new set of raw materials. Polishing and grinding techniques needed rough raw material. So basalt was used by them.

This work has got its own importance in the sense that bio-cultural process of development of man is closely linked with his technology and the latter is directly related to raw material. The technologically developed tool types were directly related to petrologically good tool making raw materials.

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A Dynamics of Self and Modernity : Reflections on The Methodology and The People

ARNAB DAS AND DIPAK K MIDYA

The experiences of operating psychoanalytic ideas for looking into the self organisation in researcher's own social-cultural space of a Third World urban linguistic community have been articulated to emphasise on three main themes. First is the relatedness between psychoanalytic methodology and contemporaneity. Next is recasting this particular participant observation where the researcher subject enters into a multipositioned and nonterminable participation to reproduce relentlessly the images of self in relation to modernity. Finally, some relevant issues of most contemporary urban studies are seen to help presenting a critical stance to the historically resultant mystification of their socio-symbolic realm. The mystique and the lost possibility of grounding own unreason remain live enough to overcharge the subjects under extreme threat of powerlessness in mastering the dominant identity structures of capitalism and paradoxically searching some different ones to resist any domination as well.

The paper is a piecemeal construction of the facts of experiencing psychoanalytic approaches in Social Science exercised for the purpose of research into some identity questions of urban Bengalees. The intension of this writing is not to present any sort of sequential appraisal of the field study. Rather, some experiences about the use of psychoanalytic knowledge are linked in order to reflect on a somewhat different methodological understanding and different findings.

THE TIME PSYCHOANALYSING ITSELF

The anthropologists coming to terms with Freudian ideas and enthusiastically seeding them across different subfields is now a long story of more than last fifty years. At introducing some basic facts and questions of Psychoanalytic movement, Gellner (1985) denotes this manifold phenomenon as a theory, a technique, an organisation, a language, an ethos, an ethic, a climate and if not anything else. He (1985) undertakes a novel project of providing an intensive overview of how the structure of the system of psychoanalytic ideas are congruous with the distinctive social and intellectual condition as well as serving the deep and pervasive need of mankind in the present age. Therefore, it is no new task of anthropologists to establish that the relatedness between contemporaneity and psychoanalysis is multifarious (e.g. Badcock, 1980; Fine, 1979; Gabriel, 1986; Spurling, 1989).

The present researchers would, at first, like to initiate argument by shifting the point of contention. That is, how the researcher as a subject is situated in the contemporaneous world which comprises of both the people under study and academic reality. The researcher as a coordinating agent, if becomes, part of both the realms, it produces a challenging turn of the problem of understanding any anthropological study. Indeed, in the present case, the participant observer himself, an urban Bengalee subject deals with the theme of self organisation of his own people. Use of psychoanalytic ideas infuses radicality into that turn of the problem, because psychoanalytic theory challenges those anthropocentric evaluations of selfhood which see individual as essentially rational, unified and conflict-free or integral agent of culture/society. Psychoanalysis suggests a basic split in the psychical universe between consciouness of the self and its other which is unconscious.

Now, considering the previously mentioned two overlapping realms, social-cultural and academic, the situation of the urban Bengalee participant observer operating psychoanalytic theme can be subjected to self-referential exploration in the coterminous background of contemporaneity. In both the realms, the researcher subject sees himself, like any other social being, always getting into some objective reality and living with different subjective positions. The subject is also historically and spatially bound to the same order of the world. In fact, contemporary world, as differentiated in terms of technological progress, economy, politics, social-cultural milieu, ethnicity, gender, class, status group, ideological systems etc. has provided us with a huge and changing inventory of different, often, counteracting systems of meaning in elucidating the conditions and positions of subject belonging to any realm. However, in this time of polyvalency and multiplicity, the fact appears inevitable that such contemporary compound reality of academy, people under study and the researcher subject in between may be psychoanalysed to reflect unending blends of split images. Perhaps, it is that time which Bauman equates with "modernity coming of age . . . . looking at itself . . . . making a full inventory of its gains and losses, psychoanalysing itself, discovering the intensions it never before spelled out, finding them mutually cancelling and incongruous," (Bauman, 1990). It sees "its own impossibility, a self-monitoring modernity, one that consciously discards what it was once unconsciously doing" (Bauman, 1990). So, it is clear that a researcher coming of such a time and engaging in such a tradition may not escape rethinking critically his/ her own split and changing situation over and over again. It also becomes one of the new facets of understanding anthropological participation itself (e.g. Sengupta, Das & Bagchi, 1995).

PARTICIPATING IN A MULTIPOSITIONED AND NONTERMINABLE PARTICIPATION

Another pertinent attribute may be brought in in the recasting of psychoanalytic participation. Going into the analysis of unconscious, especially for unfolding the truth of self and/or other, one may try to realise how the dimension of time is synchronised in this approach. It will be contexual to follow how Felman (1987) alludes to Freud's phenomena, "Freud had a way of telling stories about other and of telling others stories about himself-that made history." This attitude of analysis may be expounded in another famous parotrayal which is featured by a relentlessly deconstructive inertia that provides no end points or perfect solution-just living with trouble. The analysis keeps on moving, striving to tame a wild otherness, which it feels untameable (Reiff, 1966).

These methodological attributes of inherent ceaselessness and emanating flux of split images are introduced in this discussion to argue for some relevant implications of anthropological participation. The implications are more intricate where the observation and analysis concentrate on the sphere of self and that self inside the observer's own cultural space and where the distance from the observed (analysand), available in the clinic is hard to obtain. From the methodological perception this work may be seen to have two aspects, one approximating some anthropological studies and the other resembling the modern clinical practice. There are many anthropological works which involve the researcher in the study of his own people. On the other hand, in the clinical situation, the analysts and the analysands are frequently from the same modern culture.

First, in reference to anthropological perspective, it is not the normative plane of culture with which the researcher has the sole concern. It is quite unlike the commoner empirical study examining urban culture or modernity. It is also minimally interested in typical abstract element, like personality, which had been used to achieve psychoanalytic gestures in great many anthropological works. Here, the sources of enquired otherness are already said to be the researcher himself and the other Bengalee subjects. At five levels of self, i.e. individual, group, organisation, community and beyond, the participant observer has to seek different media of manifestation where the subjective and the intersubjective spaces may be made open to analysis.

Now, from the researcher subject's immediate situation it is not a work of knowing the distant and unknown (social-culturally) other people. It is not a direct case (academically) of First World knowledge and sensibility meeting Third World people (e.g. tribals, peasants, urban people etc.) Rather, it grew out of the Third Worldly state of mediation of knowledge and sensibility. But, it is not even a Third World urban researcher looking at the distant and unknown tribals or peasants of his own country. It is coming in a face-to-face interaction with his own reality, self and modernity in a Third World urban situation, a specific mirroring of truth in one's own participated and split reality.

The interpretation on the other aspect, the question of resemblance with the clinic, may play a complementary part in the evaluation of anthropological participation. To begin with, the field work situation may be distinguished from the clinical situation by means of such following interrelated criteria. The objective, organisational infrastructure, associated role-and power-structure in the relationship between the observer and observed, the nature of interactions, all differ remarkably in those two circumstances. Again, as the present work is not clinical, the methodological reconstruction may opt to take away emphasis on the positivist practice of entering in and withdrawing from the case studies after therapeutic success. Actually, after the last few years of field interactions, the present investigator can not yet foresee where this kind of participation in his own cultural space may completely terminate, because, it is not merely a question of becoming more authentically and skillfully experienced about one's own socio-symbolic setting. It is, rather, absorbing the incessant urge of deconstructing the reality in which the subject, himself is embedded. For the purpose of completing work it may be just somewhere stopping idiosyncratically the systematic analysis of experience, assorted from split psychical universe of the people. Presumably, the remaining possibilities, like the future tracks of that critical urge, the impact of the effects of psychoanalytic relationships and knowledge on both the analyst and analysand and can not be put to an end. The clinical traditions, nevertheless, are very scrupulous in accepting the undeniable effects of psychoanalytic encounter on both analysts and analysands. The elements of psychoanalytic relationship have deeply sustainable capacities to generate the phenomena like transference and countertransference. The therapists of most traditions are so sincerely committed to their positive image of successful emancipator that they have increasingly refined the standard of treatment which seems to guarantee the effective autonomy of both parties, at least, to help getting rid of the troublesome effects. Still then, like any truth of intersubjectivity, the effects of this psychoanalytic relationship can not be proclaimed dissolvable. The relation can never let the analyst (observer) go at least (Roustang, 1993). As the present worker does not primarily intend to render any therapeutic service to the analysand, he has to enage himself more deeply not only in (a) mirroring the subjects, but (b) at the same time actively being present in front of the mirror, visualising the reflected images of them. (thus, at the same time, the effects of that particular mirror on the images) from the utmost proximity with the indifferent subjects for finally, (c) validating the images by testing and trying to perceive the outcome of such discourse. In installing himself in so many others' positions, in a single act of participant observation, the situation becomes more complex if he has to take another position of being critical to the fundamental reality of mirroring or the whole signifying system of the examination. This is exactly what went on in course of the present work.

Some experiences associated with the different subject positions, acquired academically and social-culturally from this specific participant observation have roughly been constructed above. The emergent course of performance settles how often close anthropological and clinical practices merge into and quit this articulation. Some deeper implications of the effects of such positions and practices have also been touched upon. It leads to the significant recognitions, like, nonterminability is the last word from the very beginning of the methodological realisation and it implies the permanent insufficiency & discontent in the result.

Few Images In A Parallel Space

Before going through the loose discourse with the findings of the present work a few words from contemporary urban studies are thought worth-mentioning.

The greatest strain of debate there is between grand theoretical construct of the global structuralists and the effective research articulations of the local idealists. The mobility within thoughts on urban questions toward the latter trend is in keeping with the postmodern affinity for emphasis on the unique, the openness of the interpretation, and the application of finely recombined theory (Flanagan, 1993). King (1990), who chooses to portray the significance of culture within anthropological vein, along with others (e.g. Robertson, 1987) would raise issues that global process of urbanisation is not unidirectional in terms of its cultural product. Urbanisation in Third World may be structured as a process whereby consciousness and habits change not being engulfed by a single global homogenisation. Instead, as a product of the interaction of local and global factors the local variations are brought about as a result of the global force joining the local cultural and historical (including the remnant elements of particular imperial, colonial) features. However, the difficult desire that the localists (innovations in empirical level) and globalists (operating at the order of theory) may come to certain synthesis is far from any realisation. Only the search for any one to reach the growing tacit agreement that the urban environment is primarily a physical manifestation of international capitalism. The empirical case studies are at least vital to understanding how the impact of global market forces on localities vary.

Therefore, the priority in the contemporary train of urban studies also legitimatises the urban socio-symbolic environment for a linguistic group of people in localities of a Third World metropolis (Calcutta} to be an eligible and vibrant site for finding out the truth of time. This apparently less-than-essential exposition of the thematic relevance of study also in the contemporary urban social thought is only to arrive quickly at the justification of relating areas of the work to the facts found in a parallelly valid and established academic space. So very briefly comes the related findings of the present work.

The post-colonial Calcuttan Bengalees invariably live in a space which can not escape the domanation of capitalism. However, it may appear striking to see that the manifest systems of meaning; found there, do not represent any single globally dominating orientation. Conversely, rule of some identifiable local systems is not also pronouncedly indulged. Consequently, the situation of the conscious socio-symbolic system may be felt not to be the domain of any one system. Furthermore, it is too simplistic to brand it only a local variation or a product of global forces and local cultural and historical features.

The researcher initially concentrated on two empirically differentiable adjacent pockets of the city. One was settled by old poorer artisan community which has the traditional occupations of producing and selling earthen idols, pots, etc. The other is a recently growing planned settlement, occupied by the wealthier people, migrating from different neighbourhoods and other social backgrounds. In both the localities the researcher has lived for number of years. The consciousness and its variation across the localities, as extracted from the selves, can suitably be explained in terms of the objective reality and subjective positions, in a Third World urban context. But, the closer look of case studies, reveals something different.

It is in the name of local traditions (e.g. caste, religion, lineage, elite, neighbourhood and other factors of local orientation), rationalities in the market and their recombinations, fantasy, ambivalence, deviance and all sorts of inexplicable unreason are labelled and depicted. The market nurtures and encourages different agencies to have impinge upon the people and to make them feel integrated to reality. In spite of complete 'official' submission to this 'foreign' reason, somewhat 'unofficial' equivalence of the global and the so-called local systems is evoked. The consequent polyvalency of systems effects confusion and indeterminancy of the 'innocent' subjects. Otherwise, the polyvalency is utilised for achieving situational advantages and means to different interests. Thus, the unequal struggle or equivocal confluence of the systems is itself a condition of uncentainty and ambiguity in bringing out the actual socio-symbolic from the subjective and intersubjective spaces. The circumstance is potent enough to mystify the socio-symbolic as such. In fact, these so-called local systems had lost its gravity towards its own space for ever. The systems with their all the loose elements, overarching the socio-symbolic, have become the most reachable resources of realizable fantasy and vital resistence to other powerful system. On the other hand, just like those local elements, the agencies of rationalities are also trapped and imagined as the 'foreign' means to rescue from drowning in trouble. In such condition any absolute hierarchy of systems can not successfully function to harness the socio-symbolic realm so as to impel the subjects to hold on to any definite episteme and to allow any existing single psychoanalytic approach to be capable of unscrambling the unconscious deterministically. The examples of mutations in the psychical universe may be traced even to the preoedipal stage of life. So, it becomes difficult for any single existing positive psychoanalytic school, substantiated by the First World subjects, to structure the psychic process of the Bengalee subjects definitely. Even in the situations of pleasure the honest and/or authentic subjects have been found to remain haunted by the uncertainty of grounding their own unreason, whose loss for ever is blurred by the metaphysical presence of something other than the oppressive system in the socio-symbolic. In the face of inexorable failure to articulate the unconscious and the symbolic and to overcome the tension of powerlessness of a Third World capitalist surrounding, the sublime mystique of socio-symbolic and ideological polymorphism offer a lot of possiblities. Among the most inevitable ones is the possibility of indomitable mastery over the signifying system of the market in an overcharged manner of putting ideological and other resistence to capitalism. It helps to absorb the same identity processes of the First World subjects, but in a different background of overdetermination. An apparent anarchy of discourses is seen to be there which also helps escaping from the unpleasant rigor of reason and at the same time, appropriating the order of reason. They are both directed to the same need of excess accumulation of pleasure. Setting aside all the related discussion, the researcher has taken up a political-ideological encounter with this consequence.

Most succintly, from the ideological standpoint the aforesaid situation questions subjectivity itself and can acquire legitimacy only coming back to political contexts of historical binding of desire in a Third World context. Never surpassing the task of moral, critical reflection on reality the suggestion of Elliott (1994) may be held viable. According to the concreteness of the studied power situation, "rather than to hope for the ideal of conceptual unity in contemporary psychoanalysis, ... to articulate the difference in . . . " is a more tenable basis of deriving politically valid psychoanalytic knowledge.

We gratefully acknowledge Prof. Gouranga Prasad Chattopadhyaya and Dr. Shyamalkanti Sengupta for their valuable suggestions.

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Morphometric Study on Mesolithic Culture of Upland Bengal

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Abstract : Recent field investigation carried out during last five years, 1989-94 field seasons, in the districts of Purulia and Midnapore along the valleys of the Kangsabati, Tarapheni and other tributaries have brought out a number of Mesolithic sites containing microlithic tools. Some observations were made on field stratigraphy and archaeological materials in laboratory analysis. The archaeological materials are mainly confined to microliths found in alluvial context as well as on the surface. Morphometric studies with appropriate statistical tests are made using correlational matrix, multiple regression and multiple correlaton coefficients on length, breadth and thickness of the microlithic tools. Partial and multiple correlation coefficients are conducted for each site-type with appropriate statistics t_1, t_2 and F. It appears from the tests that there is no significant differences among the microlithic tools of a particular type found in different sites. On the basis of such statistical tests it may suggest that mesolithic sites of South West Bengal are homogenous in nature.

INTRODUCTION

Prehistoric artefacts from the Upland Bengal was reported as early as 1865 by V. Ball, a pioneer field geologist, just after two years of the famous publication of Charles Lyell, "The geological evidence of the antiquity of Man" in 1863. There after Krishnaswamy (1947) Sen (1963), Lall (1958), Dasgupta (1967, 1971), Sen and Ghosh (1963), Ghosh (1961, 1962 and 1971) and Bhattacharya (1991) have made considerable contributions in studying prehistory of West Bengal.

Besides, earlier workers namely Bhattacharya (1982), Chakraborti and Chattopadhyay (1984) and Ghosh (1961, 1962, 1966) have also reported prehistoric implements from this region. Bhattacharya (1987) has discussed geomorphology, stratigraphy and prehistoric industries including non-geometric microlithic tools with special reference to Tarapheni Valley.

It has been observed that microlithic tools found from old alluvial surface including part of the Chotonagpur plateau of West Bengal are characterized by mainly blades, points and burins, lunates, blade flakes and scrapers which can be considered as Mesolithic culture (Bhattacharya: 1978, Chakladar: 1952, Lal: 1959, Mazumdar: 1937). Such a non-geometric microlithic tradition is often found to be associated with blades, arrowheads and knives. The context of occurrence of these artefacts are reddish silty soil impregnated with *kankar* and in some places highly eroded surface with loose gravels. Typology and context of occurrences suggest considerable antiquity for the microlithic tradition. The presence of Upper Palaeolithic tool types, rarity of geometric variety and the absence of crested ridged blades as well as pottery of any sort corroborate the fact that the microlithic tradition belongs to the culture of Mesolithic stage. Similar assemblages of microlithic tools have been found in Bamudiha-Kechunda villages (86°48' 34.39" E, 22°40' 32.43" N) on the bank of the Tarapheni, about 50 km. north west of Jhargram, a sub-divisional town of Midnapore district as well as Phulsatanr, Kashipur, Totko, Begunkondar, Supurdih and Simni of Purulia district.

SITES AND STRATIGRAPHY

The exploration carried out recently are confined to the region along three tributaries of the Kangsabati river – Totko, Kumari and Tarapheni. About a dozen of sites have been found along the banks of the Totko, Kumari and Tarapheni; they are normally situated on the high cliffs of about 8 to 12 meter high from the river bed. Ground surfaces of the cliffs are flat due to prolong weathering. In most cases gully erosions are very prominent.

Stratigraphy : A closer inspection at different places have suggested that the rocks are mainly granite, gneiss and Archaean schists.The exposed section in Bamundiha at the middle reaches of the Tarapheni shows cemented gravel of about 2.5m. thick. Upon this cemented gravel there is a thin layer of silt, clay and nodules with a thickness 0.8 cm. In other places at Dumurgonda two gravel beds are separated by a silt layer is seen.

Sites : Mainly following sites, lie in between the region of 86°-87°30'E and 22°20'-23°45'N is are important in many respects and a brief account on such sites are delineated below :

Table 1 : List of recent Microlithic sites

Sl. No.	Name of the site	Location	District
1.	Phulsatanr	86°10'30"E 23°10'10"N	Purulia
2.	Kashipur	86°41'E 23°26'N	Purulia
3.	Totko	86°31'E 22°42'N	Purulia
4.	Begunkondar	86°30'E 23°21'N	Purulia
5.	Supurdih	86°3'40"E 23°20'30"N	Purulia
6.	Simni	86°30'40"E 23°27'N	Purulia
7.	Bamundiha	86°48'34.39"E 22°40'32.43'N	Midnapore

1. Phulsatanr : In the district of Purulia under the jurisdication of Arsa police station the site is located in the village mouza Phulsatanr. The geological location of the site is 86°10' E and 23°10'10"N. A number of microlithic tools have been collected from the site along with some upper Palaeolithic ones from the eroded surface layer with loose gravels and fragments of *knakar.*

Archaeological finds from Phulsatanr : The total number of collected microliths are seventy eight of which 18 scrapers, 15 blades, 7 burins, 15 points, 5 flakes, 7 cores, 5 knives and 6 blunted back knives.

Table 2. Frequency distribution of different Microlithic tools, Phulsatanr

Total	Scraper	Blade	Burin	Point	Flake	Core	Knife	Blunted Back Knife
n=78	18	15	7	15	5	7	5	6
100	23.07	19.23	8.97	19.23	6.42	8.97	6.42	7.69

On the basis of the above Table 2 it can be stated that scrapers blades and points are found in large number. Frequency distribution, in terms of the percentage, of these microliths are 23.07, 19.23 and 19.23 respectively.

2. Kashipur : The site is in the police station of Kashipur of Purulia district. The geographical location is 23°26'N and 86°41'E. High river bank contains brownish yellow silty soil with *kankar*. Tools are found in clusters along the banks.

Archaeological finds from Kashipur : In Kashipur, 43 microlithic tools have been founded. The representative tools are 6 scrapers, 11 blades, 5 burins, 5 points, 6 flakes, 8 blunted-back blades, 1 lunate and 1 transverse arrowhead.

Table 3 : Frequency distribution of different Microlithic tools, Kashipur

Total	Scraper	Blade	Burin	Point	Flake	Blunted Back Knife	Lunate	Trans verse arrow head
n=43	6	11	5	5	6	8	1	1
100	13.95	25.58	11.62	11.62	13.95	18.60	2.32	2.32

The percentile distribution of archaeological records reveals that blade comprises 25.58%, scraper and flake comprises 13.6% each, burin and point constitute same percentage i.e. 11.62% each and lunate and transverse arrowhead 2.32% each.

3. Totko : Under the jurisdiction of Banduan police station in Purulia district the site has been identified. The geographical location is 22°52'N and 86°30'E. The area where the site is situated is highly dissceted by the runnels and channels of Kangsabati. From the brownish yellow silty *kankar* horizon of the stream banks mocroliths have been collected. The mode of occurrences in different clusters is important to be noted.

Archaeological finds from Totko : The number of collected microliths are **275. There** are 55 scrapers, 9 knives, 46 blades, 9 burins, 44 points, 36 flakes, 22 lunates. nated back blades, 28 cores, 15 chips and 1 awl.

Table 4 : Frequency distribution of different Microlithic tools types, Totko

Total	Scraper	Knife	Blade	Burin	Point	Flake	Lunate	Core	Chip	Awl
n=275	55	9	46+10	9	44	36	22	28	15	1
100	120.0	3.27 +3.16	16.72	3.27	16.0	13.09	8.0	10.18	5.45	0.36

4 – 6 Begunkondar, Supurdih and Simni : During the recent field seasons since 1991-92 the three microlithic sites have been identified from Kangsabati valley in the district of Purulia. Bengunkondar of 23°21'N and 86°50'E. The geographical location of Supurdih is 23°20'30"N and 86°3'40"E and Simni 23°27'N and 86°30'40"E. Begunkondar and Supurdih are situated on the bank of Saharjor, a runnel of the Kangsabati. The village of Simni is situated at the foot hill region of Jabhar from where a rich collection has been made. Microliths have been found from Bengunkondar and Supurdih in clusters spread over the elevated places having a radius of 20 to 25 m. The surface of the tool bearing mounds yield small quartizitic fragments and kankars. Microliths of the sites are mainly made on chert but it has been noticed that the area is almost deviod of chert. It may have been possible that the raw materials had been carried over for the manufacturing of the tools.

Archaeological finds from Begunkondar : There are one hundred and eighty five microliths of which 27 scrapers, 41 blades, 5 burins, 22 points, 3 flakes, 4 lunates, 14 cores, 67 chips and 2 transverse arrowheads. .

Table 5 : Frequency distribution of different Microlithic tools, Begunkondar

Total	Scraper	Blade	Burin	Point	Flake	Lunate	Core	Chip	Trans verse arrow head
n=185	27	41	5	22	3	4	14	67	2
100	14.59	22.61 +3.16	2.70	11.89	1.62	2.16	7.14	36.21	1.08

The Table 5 reveals that chips are found in a large number and constitute 36.21%.

Archaeological finds from Supurdih : There are 39 microlithic tools of which 2 scrapers, 11 blades, 4 burins, 9 points, 2 lunates, 10 cores and 1 borer.

Table 6 : Frequency distribution of different Microlithic Tools, Supurdih

Total	Scraper	Blade	Burin	Point	Lunate	Core	Borer
n=39	2	11	4	9	2	10	1
100	5.12	28.20	10.25	23.07	5.12	25 64	2.56

Archaeological finds from Simni : A sample of only 24 microliths have been considered from Simni of which 8 scrapers, 4 points, 1 borer, 1 flake and 10 blades.

Table 7 : Frequency distribution of different classes of microlithic tools, Simni

Total	Scraper	Point	Borer	Flake	Blade
n=24	8	4	1	1	10
100	33.33	16.66	4.16	4.16	41.66

7. *Bamundiha* : In the district of Midnapore at the upper reaches of the Tarapheni valley a Mesolithic site, exclusively microlithic in character, has been identified where the field work has been carried out at different spells since 1977 by Calculate University. The geographical location of the site is 86°48'34.39"E and 22°40'32.43"N. A large number of microlithic tools along with some Upper Palaeolithic tools have been retrieved from this area. From the different exposed sections along the banks of the Tarapheni a general stratigraphy of the region is reconstructed which was already mentioned.

Archaeological finds from Bamundiha : The total number of collected microliths are 1056 of which these, 165 scrapers, 24 blades and bladelets, 38 burins, 187 points, 148 flakes, 32 lunates, 221 cores, 1 awl, 31 borers.

8. Archaeological finds from Dumurgonda : There are two hundred and fourteen microlithic tools of which 57 scrapers, 38 blades, 15 burins, 44 points, 31 flakes, 2 lunates, 11 cores, 6 transverse arrowheads, 8 fluted cores. 1 shouldered point and 1 triangle.

Table 8 : Frequency distribution of different Microlithic tools, Dumurgonda

Total	Scraper	Blade	Burin	Point	Flake	Lunate	Core	Transver arrowhead	Fluted core	Shouldered point	Triangle
n=124	57	38	15	44	31	2	11	6	8	1	1
100	26.64	17.75	7.0	20.56	14.49	0.94	5.14	2.80	3.74	0.47	0.47

Table 9 : Classified list of sample artefect types from different sites of the study area

Sl. No.	Site Type	Bamundiha	Phuls atanr	Kashi pur	Totko	Begun kondar	Simni	Supurdih	Total
1.	Scraper	15.56 (21) 9 29	13.34 (18) 25	4.46 (6) 13.95	40.74 (55) 19.43	18.52 (25) 14 70	5.92 (8) 57.14	1.47 (2) 2.82	100 (135) 15.36
2.	Blade	32.83 (49) 21.68	10.06 (15) 20.8	7.38 (11) 25.48	30.88 (46) 16.25	12.08 (18) 10.58		6.72 (10) 14.08	100 (149) 16.95
3.	Burin	21.62 (9) 3.60	18.92 (7) 9.73	13.52 (5) 11.63	21.62 (8) 2.83	13.52 (5) 2.94		10.80 (4) 5.64	100 (37) 4.30
4.	Point	38.13 (61) 26.98	9.37 (15) 20.84	3.13 (5) 11.63	27.5 (44) 15.55	13.75 (22) 12.94	2.5 (4) 28.58	5.62 (9) 12.67	100 (160) 18.20
5.	Flake/Blade	40 (34) 15.04	5.88 (5) 6.95	7.06 (6) 13.95	42.35 (36) 12.72	3.53 (3) 1.77	1.18 (1) 7.14		100 (85) 9.67
6.	Lunate	6.45 (2) .88		3.23 (1) 2.33	70.97 (22) 7.77	9.68 (3) 1.77		9.88 (3) 4.23	100 (31) 3.53
7.	Core	32.93 (27) 11.94	8.54 (7) 9.73		34.15 (28) 9.89	17.07 (14) 8.23		7.31 (6) 8.46	100 (82) 9.33
8.	Awl.	9.09 (1) .44		9.09 (1) .35	81.82 (9) 5.29				100 (11) 1.25
9.	Borer	42.97 (3) 1.32			28.57 (2) 1.18	14.28 (1) 7.14	14.28 (1) 1.40		100 (7) .79
10.	Chips	19.60 (20) 8.83			14.71 (15) 5.30	65.69 (67) 39.42			100 (102) 11.60

Table 9 : Classified list of sample artefect types from different sites of the study area (*Contd.*)

Sl. No.	Site Type	Bamundiha	Phulsatanr	Kashipur	Totko	Begunkondar	Simni	Supurdih	Total
11	Knife		35.22 (5) 6.95		64.28 (9) 3.19				100 (14) 1.59
12.	Blunted Back Blade			44.45 (8) 2.23	55.55 (10) 1.18				100 (18) 2.06
13.	Transverse arrohead			33.33 (1) 2.33	66.66 (2) 1.18				100 (3) .35
14	Others				20 (9) 3.19			80 (36) 50.70	100 (45) 5.17
	Total	100 (226) 25 72	100 (72) 8.19	100 (43) 4.89	100 (283), 32.19	100 (170) 19.35	100 (914) 1.59	100 (71) 8.07	100 (879) 100

STATISTICAL ANALYSIS OF METRIC CHARACTERISTICS

The measurements of three variables, viz. length (L), breadth (B) and thickness (T) of sample tools of different types are considered from different sites, which are given below :

Table 10 : Sample tool types

Type	Scraper	Blade	Burin	Flake	Point	Total
Phulsatanr	39	19	15	5	16	89
Totko	53	18	44	10	19	144
Dumurgonda	57	19	25	10	41	152
Kashipur	9	18	99	10	6	132
Bamundiha	15	12	3	6	5	40

As the main objective of study is to find out interrelationship among the three variables length, breadth and thickness, here, length has been considered as the independent variable and others are dependent variables (breadth and thickness).

Let us assume that the relationship between length and breadth and thickness is given by an equation in the given form,

$$x_{L.BT} = a + b_2 x_2 + b_3 x_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(i)}$$

The data will consist of 3 values corresponding to the three variables for each of the n individuals. n however is different for different type-site combination. The values of the variables may be denoted by x_L x_B x_T (1, 2 . . . . n). In order to determine constants b_1, b_2, b_3 and the basis of the data are make use of the least square method. If we denote xL, BT the difference $x_L - x_{L, BT}$, then the value of estimating corresponding to the nth individual is x_L, B_T. Let x_L, x_B, x_T, denote the mean length, breadth and thickness for the n individuals and the corresponding standard deviations are denoted by S_L, S_B and S_T respectively. Also the matrix R when

$$R = \begin{matrix} r_{LL} & r_{LB} & r_{LT} \\ r_{BL} & r_{BB} & r_{BT} \\ r_{TL} & r_{TB} & r_{TT} \end{matrix} \qquad \text{is called}$$

the correlation matrix of x_L, x_B and x_T. Here r_{ij}'s are i, j = L, B & T are the correlation coefficient of x_i and x_j.

Equation (i) or the multiple regression equation ultimately to the form $X_{L, BT} = a X_1 + b_{LB.T} X_2 + b_{LT.B} X_3$

$$\text{where} \quad b_{LB.T} = \frac{r_{LB} - r_{LT}\, r_{BT}}{1 - r^2_{BT}} \qquad \frac{s_L}{s_B}$$

$$\text{and} \quad b_{LT.B} = \frac{r_{LT} - r_{LB}\, r_{BT}}{1 - r^2_{BT}} \qquad \frac{S_L}{S_B}$$

It is assumed that the joint distribution of the three variables is the tri-variable. Let $S_{L, BT}$ and $S_{LB.T}$ be the population multiple correlation of x_L and x_B and x_T and the population partial correlation of x_L and x_B eliminating the effect of x_T.

The hypothesis for test of relating partial correlation coefficient is of the type test H_0 : $S_{LB.T} = 0$ against the alternative hypothesis $H_1 : S_{LB.T} \neq 0$.

Appropriate statistical test for this purpose is :

$$t = \frac{r_{LB.T}\,{}^{n-3}}{1 - r^2_{LB.T}}$$

which it follows t_{n-3} under H_0.

Rule is reject Ho at level α if $|t| > t_{n-3}\ (\alpha/2)$

Again the hypothesis for test relating to multiple correlation coefficient is of the type.

To test $H_o : S_{L.BT} = O$ against the alternative hypothesis $H_{-1} : S_{L.BT} \neq O$. Appropriate statistics for this is F

$$F = \frac{r_{LB.T} / (3 - 1)}{(1 - r^2_{LB.T}) / n - 3}$$

Thus two types of test for partial and multiple correlation coefficients are conducted for each of the type-site. Therefore, to perform three tests on each of the type site combinations as outlined below :

1) To test

   $H_1 : S_{LB.T} = O,$ against $K_1 : S_{LT.B} \neq O$

2) To test

   $H_2 : S_{LT.B} = O$ against $K_2 : S_{LT.B} \neq O$

3) To test

   $H_3 : S_{L.BT} = O$ against $K_3 : S_{L.BT} \neq O$

The statistics associated with the tests are t_1, t_2 and F respectively.

Table 11 : Value of t_1, t_2 and F

Site		LB.T		LT. B		
		value of				
Type	n	t_1	t_2	F	t_{n-3}, .25	F_{n-3}, 2, 18, .025
Scraper						
Phulsatanr	18 A	.39 A	.27 A	-6.98	2.131	3.68
Totko	10	.63 A	-.11 A	-3.13 A	2.365	4.74
Dumurgonda	10	.92 A	-.27 A	-2.72 A	2.365	4.74
Bamundiha Kechunda	10	.15 A	.34 A	-3.17 A	2.365	4.74
Kashipur	6	.09	.24	-1.37	3.182	9.55
Blade						
Phuslatnr	10	.19 A	-.05 A	-3.39 A	2.365	4.74
Totko	10	-.18 A	.12 A	-3.45 A	2.365	4.74
Dumurgonda	10	.19 A	-.22 A	-2.93 A	2.365	4.74

Table 11 : Value of t_1, t_2 and F

Site		LB.T		LT. B		
		value of				
Type	n	t_1	t_2	F	t_{n-3}, .25	F_{n-3}, 2. 18, .025
Point						
Phulstanr	10	.16 A	.2 A	-3.42 A	2.365	4.74
Totko	10	.19 A	.18 A	-3.13 A	2.365	4.74
Dumurgonda	10	.41 A	.27 A	-3.04 A	2.365	4.74
Bamundiha Kechunda	10	0 A	-.05 A	-3.39 A	2.365	4.74
Kashipur	5	.16 A	.16 A	-.93 A	4.303	19.00
Flake						
Phulsatanr	5	-.24 A	-.32 A	-.91 A	4.303	19.00
Totko	10	.38 A	-.14 A	3.33 A	2.365	4.74
Dumurganda	10	.26 A	.37 A	-3.40 A	2 365	4.74
Bamundiha Kechunda	10	.22 A	.31 A	-3.28 A	2.365	4.74
Kashipur	6	.2 A	.21 A	-1.32 A	3.182	9.55
Burin						
Phulsatanr	7	.15 A	.08 A	-1.94 A	2.776	6.94
Totko	8	.44 A	.14 A	-2.33 A	2.571	5.79
Dumurgonda	10	0 A	.16 A	-3.38 A	2.365	4.74
Bamundiha Kechunda	10	.99	.48	-1.1	2.365	4.74
kashipur	5	.03 A	.08 A	-.94 A	4.303	19.00

It can be shown from the Table 11 that each of the hypothesis H1, H2 and H3 are accepted for all the type-site combination. So, on the basis of the sample it can be concluded that neither thickness has any effect on the relation between length and breadth nor breadth has any effect on the relation between length and thickness, for, the tools found in different type-site combination. Also the breadth and thickness jointly has no effect on the dependent variable length. Now, since the tests give similar conclusion for the tools of a particular type found in different sites, we can also conclude that there is no significant difference among the tools and it is more or less absent.

SOME OBSERVATIONS ON MESOLITHIC CULTURE

The Mesolithic culture of West Bengal solely comprises different types of microliths. Most dominant form of microliths are of non-geometric. Most common types are blade and bladelets with considerable number of flakes. They are found from open eroded surface along with upper palaeolithic tools. As a tools occur on *kankar* mixed soil or upper surface of eroded lateritic soil, it seems that they belong to Early Holocene period. Microliths occur in clusters and spread out along the bank of the streamlets. It has been noted that the average distance between two microlithic sites in Totko valley and in the Tarapheni valley are about five kilometers. As it is stated earlier in connection with statistical analysis that the microlithic sites are homogenious in nature inspite of the fact that their distributed in different places. It can be stated that microlithics tools are made by the same people who were nomadic and often changed their habitat and migrated through river banks. The map showing distribution of microlithic sites show very high concentration of microliths in Upland Bengal. From the distribution of analysis of microlithic sites it can be stated that there were considerable population who lived in early Holocene time earning their livelihood by hunting, gathering and fishing. They had to migrate when the resources of the habitant were depleted. Finally, it appears that Mesolithic Culture of Rarh Bengal is very rich and homogenous which deserves intensive indepth study.

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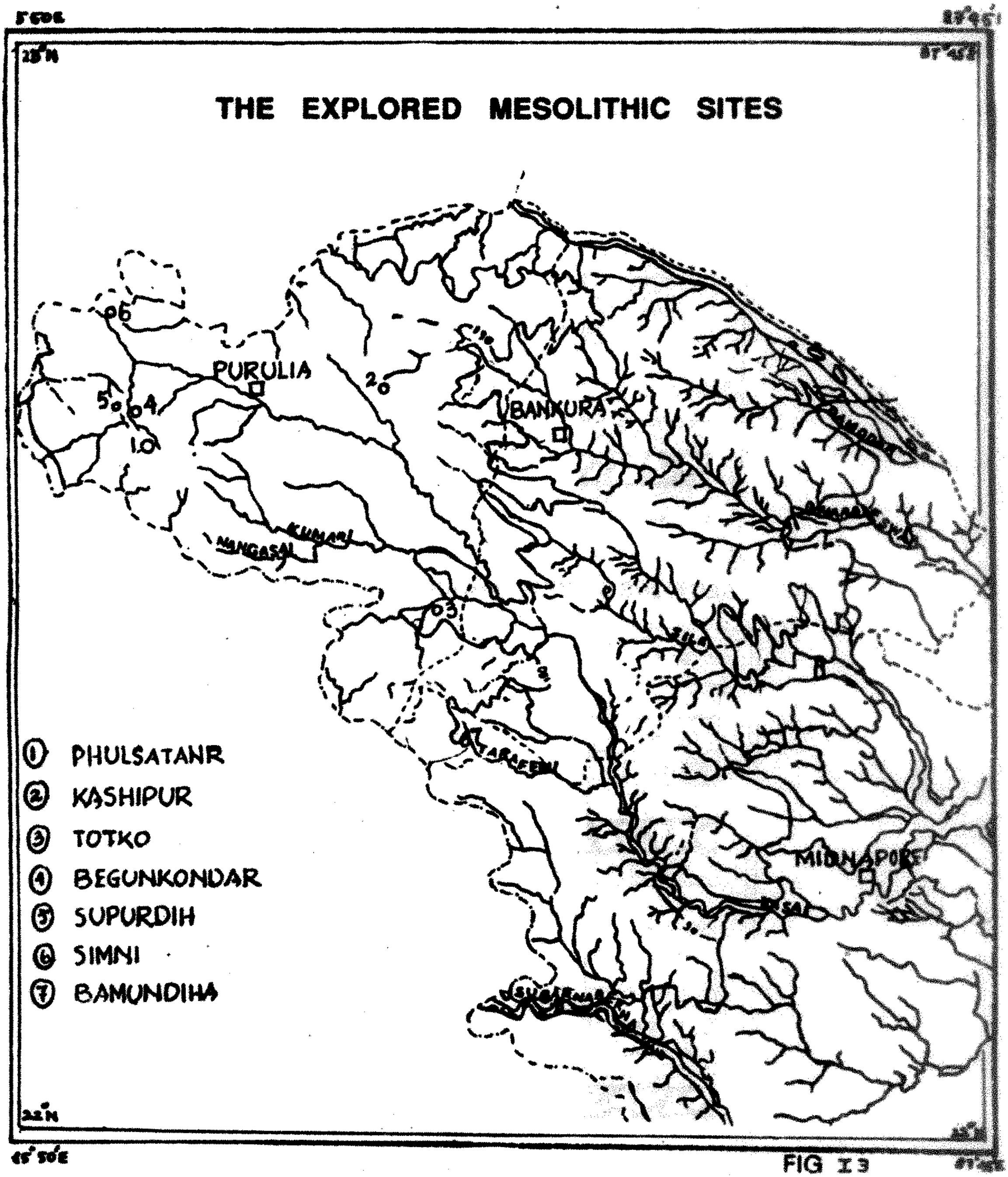

FIG I3

FIG : I MAP SHOWING MESOLITHIC SITES IN SOUTH WEST BENGAL

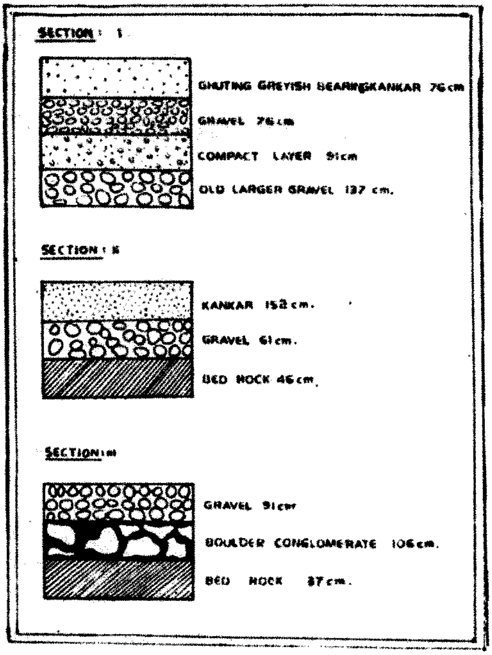

FIG : II SECTIONS STUDIED AROUND TARAPHENI.

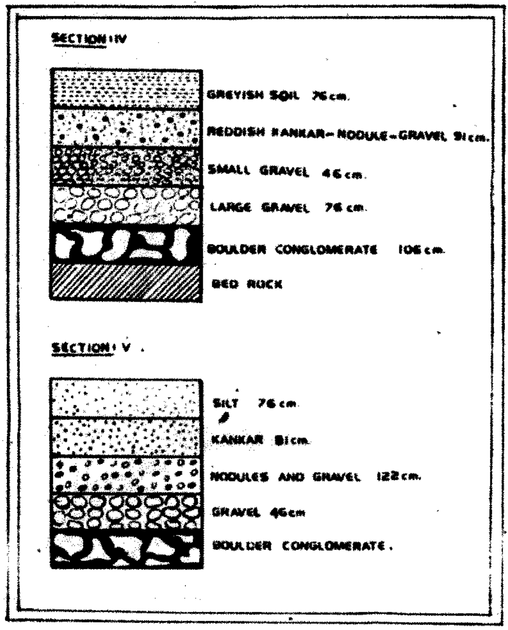

FIG : III SECTIONS STUDIED AROUND TARAPHENI.

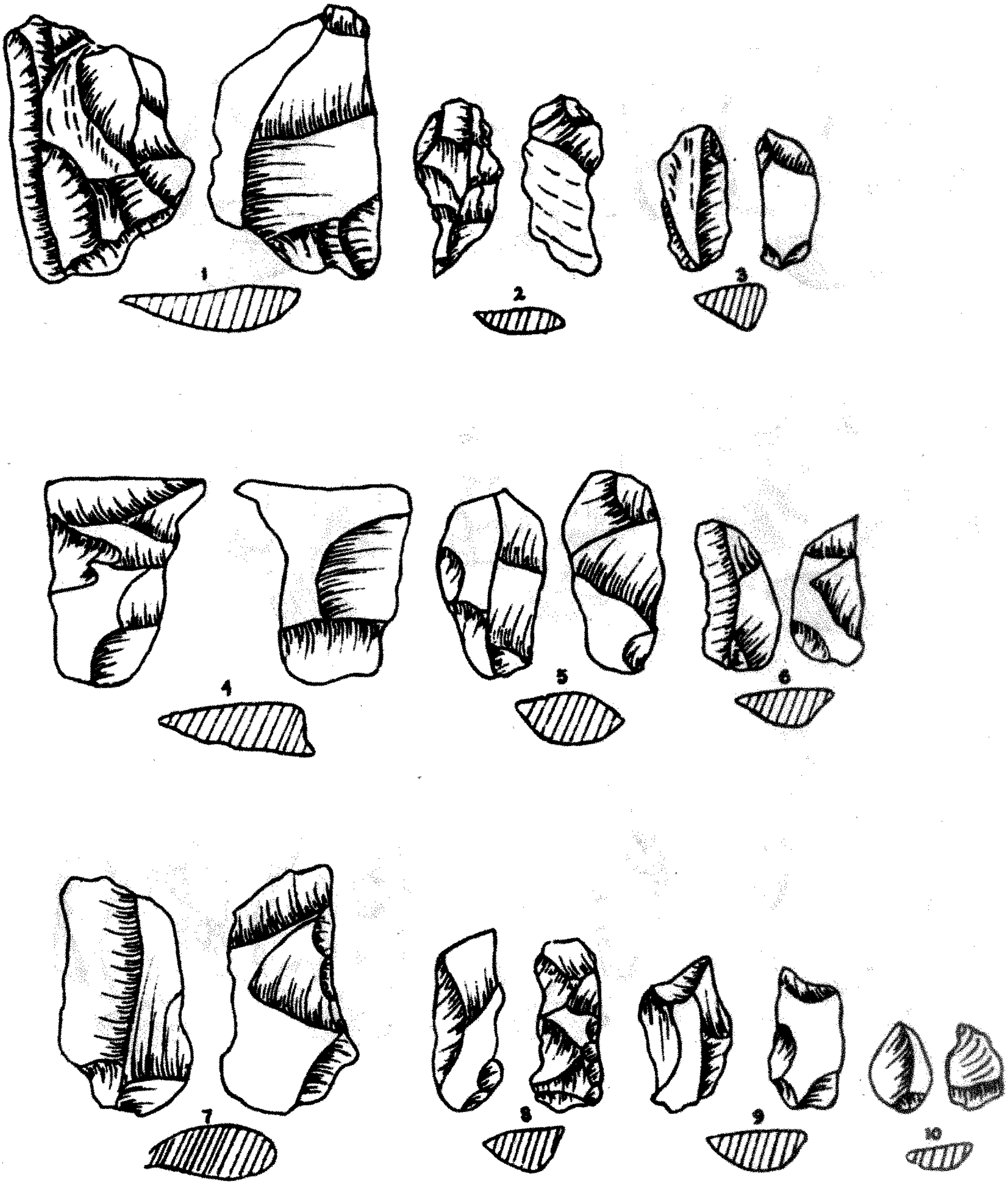

FIG : IV. 1, 4, 7~ FLAKE; 2, 5, 8~ BLADE; 3, 6, 9, 10~ POINT.

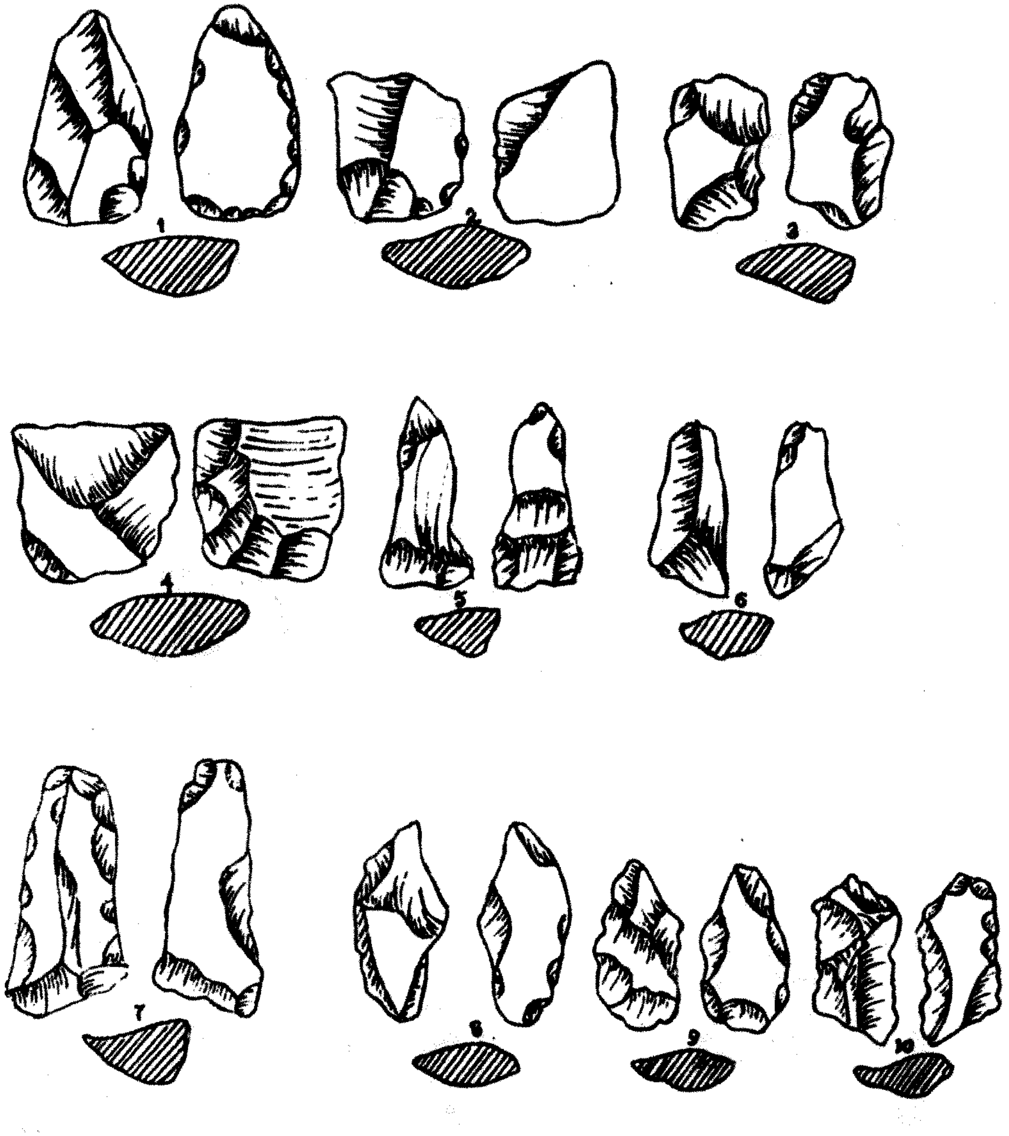

FIG : V. 1, 8- POINT; 3, 6,- SCRAPER; 4- FLAKE; 5- BURIN; 7, 10~ BLADE.

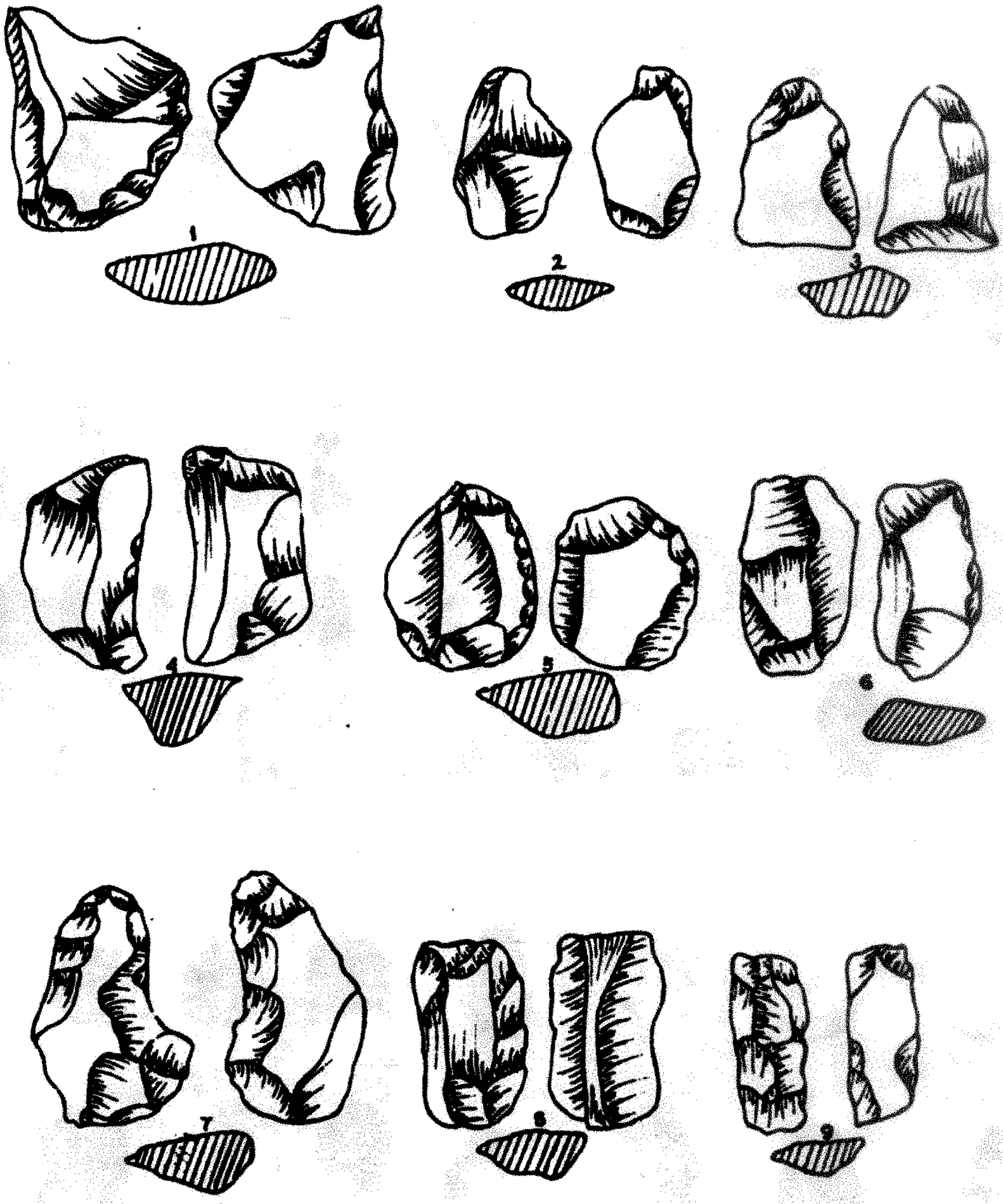

FIG : VI. 1- SCRAPER; 2, 3- BURIN; 4- BLUNTED BACKED BLADE; 5, 6- CORE; 7 POINT; 5. 9- BLADE.

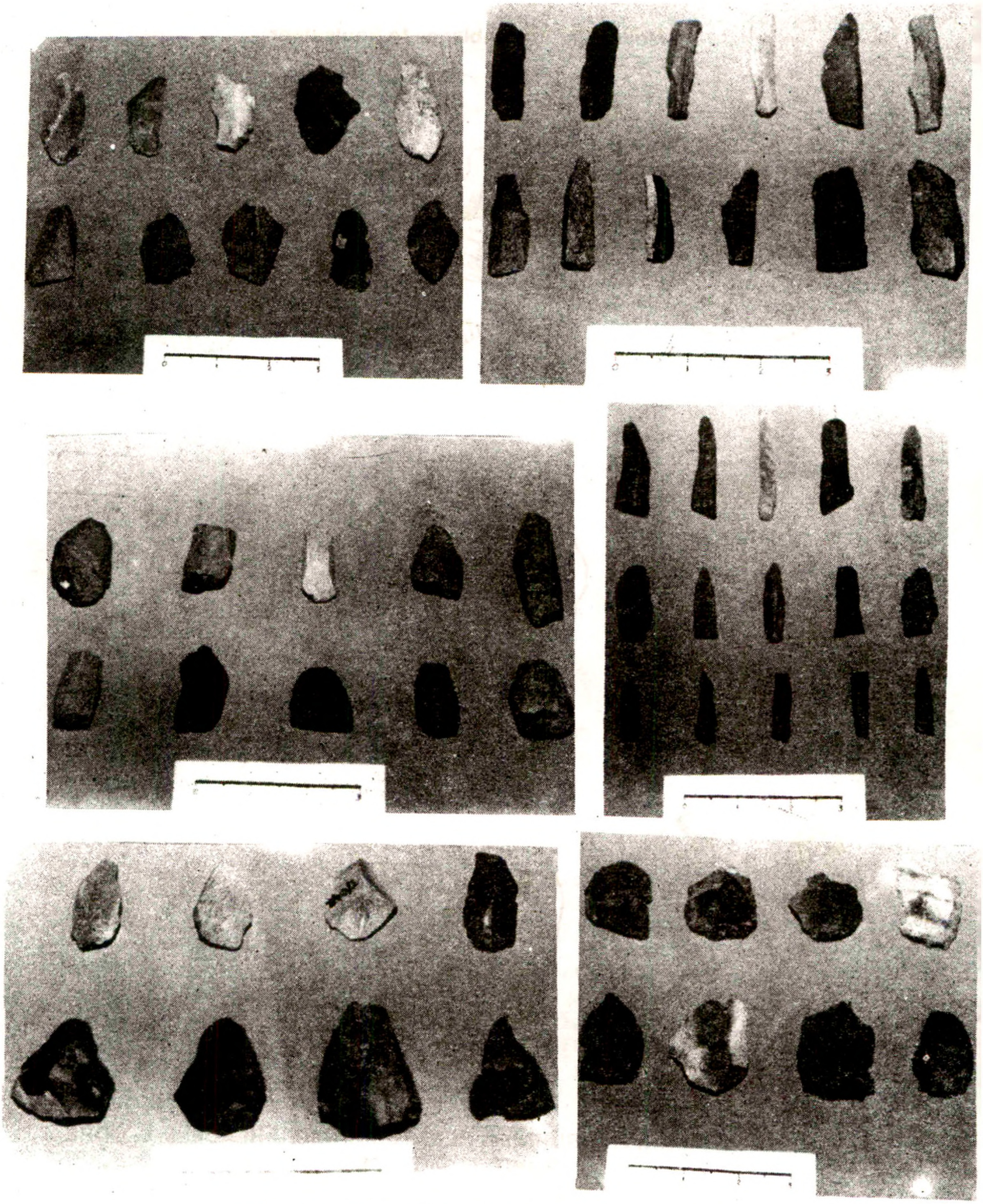

FIG : VII MICROLITHIC TOOLS, UPLAND BENGAL

Tribal Life, Culture and Development : an overview

AMAL KUMAR DAS

The largest concentration of tribal people anywhere in the world, except perhaps Africa, is in India. Accroding to the 1991 Census, the population of Scheduled Tribes was 6.78 crores constituting 8 per cent of the total population. The tribals in general live in the backward areas of the country and the dominant tribal areas comprise about 15 per cent of the total geographical area of the country. Total tribal population of West Bengal as per 1991Census was 38,08,760 constituting 5.60 per cent of the total population of the state, occupying 8th position amongst States and Union Territories in respect of Scheduled Tribe concentrations (5.62%).

The British Administration came in contact with the tribal people in the latter half of the 18th century when the Paharias of Rajmahal Hills revolted against the Land Lords. The necessity of a 'Special type of administration' was felt desirable from that time onwards for the tribal people who inhabited the extremely under developed regions cut off from the mainstream of national life. The policy that was adopted in pre-Independence era towards the tribal folk was known as 'isolation'.

Due to the exploitation of the tribal folk by the 'outsiders' with the support of the alien rulers there occurred serious rebellions and resentments amongst different tribal groups in different regions and at different times. Mention may be made of the following–rebellion of the Paharias in Bihar (1778), Koli uprising in Maharashtra (1784-85), Chuar rebellion among the Bhumijes of Manbhum (1795-1800), Kol rebellion among the Ho of Singbhum (1832), Ganganarian revlot among the Bhumij (1832), Sardar Larai (1885), and Birsa Movement (1895-1900) among the Munda of Ranchi, Santal rebellion (1855-56), rebellion of the Kacha Naga (1880's), etc. At a later phase the tribal folk also participated in the national movement under the leadership of Gandhiji.

II

Chotanagpur was declared a non-regulated area with the enactment of Regulation XIII of 1833. The Scheduled District Act was enacted in 1874. The executive was vested with the authority to exclude these areas from the normal operation of ordinary laws and gave them such protection as they might need. As per the Govt. of India Act, 1870, many measures were taken to safeguard the interest of the tribals in the non-regulatory areas.

The Government of India Act 1919 under sec. 52-A(2) empowered the Governer General in Council to declare any territory to be a backward tract and with the sanction of the Secretary of State to direct that the Government of India Act shall apply to the territory with such exceptions and modifications as prescribed in his notification.

The tracts were divided into two categories :-

i) Some areas were wholly excluded. Neither the central nor the provincial Legislatures had power to make laws applicable to these areas and the power of legislation was vested in the Governor (Laccadive and Minicoy Islands in the then Madras Province, Chittagong hill tracts in Bengal, the small areas Spiti in the then Punjab and Angul in Orissa).

ii) Modified exclusion was applied to the other backward areas which were classified as excluded and partially excluded areas. The excluded areas were placed under the provincial rule of the Governor acting in his discretion and the partially excluded areas within the fold of ministrial responsibility. The Governor excercised a special responsibility in respect of the administration of these areas. No act of Federal or Provincial Legislature were applicable to any of these areas but the Governor had the power to apply such Acts with modifications as considered necessary.

Under the Govt. of India Act, 1935, the backward tracts were classified as 'excluded' and 'partially excluded areas'. No act or law of the Central or Provincial Legislatures applied to any of these areas. But the Governor had the authority to apply such laws with modifications.

III

With the attainment of Independence it was realised that the solution to the problem of backward areas lay in development, not isolation. The National objective is their advance and integration.

Conditions prevailing in the pre-modern phase of Indian Civilization (which operated under a relatively low density of population) could afford to keep aloof a substantial portion of forest dwelling tribals in ecological and social isolation. But the present consciousness is to make the tribals fully participate as equals in the development of the country. The national policy is to integrate and level up the outlying underdeveloped tribal groups in a common national social order with the non-tribal groups as quickly, and with as little internal stress, as possible.

During the Vedic period a Tribe was a political unit and could be compared with the present 'state'. Now the term 'Tribe' indicates a group of people who are backward and poor. The term 'Scheduled Tribe' implies those tribes who are specified as Scheduled Tribes under Article 342 of The Constitution.

The specification of tribes and tribal communities as 'Scheduled Tribes' arose only after the constitution came into force. In the Govt. of India Act, 1935 a reference has been made to 'backward tribes'. As per 13th schedule to the Govt. of India (Provincial Legislative Assemblies) order, 1936, some tribes were specified as backward in the then Provinces of Assam, Bihar, Bombay, Central Provinces, Madras and Orissa. The first serious attempt to list 'Primitive Tribes', as in the case of 'Depressed classes' was made at the census of 1931. In the list of S.Ts prepared in 1950, the primitiveness and backwardness were the tests applied for specifying a Sch. Tribe. The main characteristics which are common to all Sch. Tribes are (i) tribal origin, (ii) primitive way of life, (iii) habitat in remote and less easily accessible areas, and (iv) general backwardness in all respects.

The list of Sch. Tribes were notified by the President in accordance with the provision of article 342 of the constitution. The first order was the 'the constitution (Sch. Tribes) order 1950' and the last one 'Sch. castes & Sch. Tribes orders (Amendment) Act, 1976' (constitution order 106)

To ensure progress and protection adequate provisions and safegurads have been made in the Constitution of India with different acts and orders for protecting the people concerned from all sorts of exploitation (Articles 46, 244, 275, 330, 332, 334, 335, 15, 16, 19, 341, 342 etc.)

The following criteria have been suggested by Government of India for identifying Scheduled Tribes and Scheduled castes.

Scheduled Castes : Extreme social, educational and economic backwardness arising out of the traditional practice of untouchability.

Scheduled Tribes : Indications of primitive traits, distinctive culture, geographical isolation, shyness of contact with the community at large and backwardness.

IV

The 'tribals' who they are and their place in the development of Indian Civilization and Culture is to be properly understood in the historical as well as protohistorical context. The Indian Civilization is the synthesis of different traditions of various racial and linguistic stock-Pre-Dravidian, Dravidian, Aryan, Mongoloid, etc.

There are about five hundred Scheduled Tribes in India (residing in four Major geographical regions) who are at different stages of economic (hunting/food gathering and collecting/pastoral/ shifting cultivation as well as settled agriculturist etc.) and socio-cultural (pre-literate/semi-literate; nomadic/settled/partiarchate/matriarchate/patrimatri, etc.) levels of development. Many of them still retain their 'own way of life' though with certain modifications due to acculturation. Hunting and Food gathering tribes are Andamanese, Jarwa, Onge, Birhor, Chenchu, Kadar, Kurumba, etc.; the Toda, Badage Kota, etc. are pastoralists; Khond, Bhuiya, Korwa, Paharia, Naga etc. practised 'shifting cultivation'. At present most of the tribal groups (Santal, Gond, Oraon, Munda, etc.) are settled agriculturists.

The 'life style'/ culture pattern of these communities have taken shape in accordance with their ecological set up and 'mode of living', still there exists a good deal of similarity amongst these communities at individual, racial and culture area levels. A thorough knowledge about the 'way of life' of these communities as well as proper understanding of their 'way of thinking' and 'behaviour pattern' at various phase of life and activities are prerequisite for any developmental activity. Acceptance/non-acceptance of any innovative measure largely depends on how far we understand and appreciate their culture and 'mind'.

There are at present 38 Scheduled Tribes in West Bengal. Racially, linguistically, and culturally they may be grouped into two broad categories-Plains tribals and the tribal groups residing in the Himalayan and sub-Himalayan regions. The former category, i.e. plains tribal groups is predominated by tribal groups of pre-Dravidian and Dravidian racial stock (Oraon, Mal Paharia, Santal, Munda, Bhumij, Birhor, Kora, etc.). Their dialects belong to Austric and Dravidian speech family of Languages. They are patriarchal societies. These tribal groups, migrating from neighbouring states of Bihar, Orissa have settled mainly in these districts (Midnapore, Bankura, Purulia, etc.) bordering these areas of West Bengal.

Tribal Groups from Chotanagpur plateau and Mayurabhanj area (Santal, Oraon, Munda etc.) were brought over to Sundarban area for reclamation of forest land about a Century back. Totally cut off from the congeners of their home they now lead a new pattern of life here which reflects a well balanced synthesis of Tribal-Hindu-Muslim 'way of life'. Similarly, tribals have settled in Murshidabad, Nadia, Bangladesh area where they came in connection with the indigo plantation. These tribal groups are also well known for their skill as tea garden and colliery labourers in Darjeeling, Jalpaiguri, Burdwan districts. Of the plain tribal groups 'Lodhas/Kherias' are regarded as 'Vimukta Jati', and 'Birhors' as a semi-nomadic community.

The indigenous tribal groups of North Bengal (Darjeeling, Jalpaiguri and Cooch Behar) belong to mongoloid racial stock. The dialects of Lepchas and Bhutias belong to Tibeto–Chinese family of 'Tibeto-Himalayan group'; dialects of Mech, Garo and Rabha to Assam Burmese group of Assam Branch and Chakma, Hajang, Mag to Burma group of Languages. Though these mongoloid tribal groups jointly share 3 percent of the total Scheduled Tribe population of the State, they are well known for their progressive character structure and colourful life style. Majority of these population have migrated from Sikkim, Bhutan and Assam.

Religious Life and activities, fairs and festivals; songs and dances; life cycle (Birth/ Marriage/Death) etc. widely vary amongst these tribal groups of two broad geographical zones. Further, there are differences at the micro or individual community level.

Developmental programmes are therefore to be designed and implemented in such a fashion so as to make them really effective and meaningful and easily acceptable as per needs, aspirations and socio-cultural life style of the population concerned. Schemes drawn up and implemented in a thumb rule fashion, will not only lead to rejection but may give rise to 'social maladjustment'.

Proper functioning of a society constituting of units and institutions is therefore to be properly understood.

V

Since the beginning of our Five Year Plans, Schemes were drawn up for an overall development of the social, economic and cultural life of the tribal communities. At the end of the Fourth Five Year Plan the whole situation was reviewed. It was found that some of the communities made substantial pregress in relation to economic and educational achievements whereas a vast majority of them lagged far behind. This happened also in the case of individual communities amongst whom some persons were found quite well off in comparision with others of the said community. This gave rise to conflict and tension in the inter as well as intra community level. In addition to the above, there persisted a wide gap between different areas in the level of development as happened in the ethnic level. A number of factors was responsible for giving rise to such situation. For bridging up the gap of imbalance that existed at regional level, programmes under Tribal Development Blocks were prepared but the ambit of the same in operational terms was very limited. These Tribal development Blocks were mainly concerned themselves largely with the usual developmental schemes and social services. These schemes were generally formulated for the comparatively advanced areas and extended to the tribal areas in the same form. There was emphasis in principle towards protective aspects, but they were not organically linked with other facets of administration and development. Therefore, a new strategy for tribal development was adopted since the beginning of the Fifth Five Year Plan. The areas having 50 per cent or more tribal population were identified and special plans (Tribal sub-plan) were prepared. This new strategy could cover only 59.88% of the total tribal population of the country whereas the rest remained out side the orbit of the development plan. No special attention was given to their problems. In the case of West Bengal the coverage was only to the extent of 50.6 per cent.

At present there are 191 Integrated Tribal Development Project Areas (ITDP) in the country out of which 33 are spread over in 13 districts of West Bengal. There are 74 communities identified as Primitive Tribes in India, of them three are in West Bengal (Lodha, Birhor and Toto). There are 268 MADAS and 74 cluster areas in India. But there is none in WestBengal. About 70 per cent of the total population of India are covered in ITDPS & MADAS.

The strategy adopted during the Fifth Plan was "area development with focus on the development of tribal communities. for areas where tribals are a predominant community". The above concept was formulated on the basis of the following prevailing situation in the tribal areas.

a. Amongst the Scheduled Tribe Communities there remains variations in the Social, Political, Economic and Cultural levels.

b. The demographic situation reveals that in certain States the tribals have concentrated pockets whereas in other parts they are scattered and live interspersed with general population.

c. There are a number of primitive tribal communities who are at pre-agricultural and pre-literate stage and live in secluded regions in isolation. In a nut-shell it may be stated that Tribal Development was related to their level of development and pattern of distribution. In concentrated tribal regions, area approach with focus on development of tribal communities was favoured while for primitive groups, community oriented programmes were preferred. The main purpose was to eliminate exploitation in all forms and to build up inner strength of the people and to improve their organisational capability.

The working group on Tribal Development (1980-85) observed that though the approach and strategy were clearly worked out but the success in relation to planning and implementation of programmes were very limited. The elimination of exploitation which was one of the basic objectives during the Fifth Plan has had only very limited success. The Administrative unpreparedness appeared to be main constraint in implementation of programmes and protective policies. A review of different documents dealing with tribal development reveals that the benefits meant for tribals have not yet reached to a substantial section of the population concerned. This has resulted in widening the gap between the tribals and non-tribals of a particular area and also accelerated the processes of exploitation in a more effective and organised way.

The post-Fifth Plan strategy tried to attack the tribal problem from three angles classifying the tribals into three categories :

a) Tribals in the area of Tribal concentration.

b) Dispersed tribals in other areas, and

c) Primitive tribal communities. Thus the developmental meausures were designed to be area oriented, community oriented and individual family oriented for the respective categories of population.

The urgent task, according to the report of the working group on Tribal Development during the Seventh Plan (1985-90) was to create in the economic field impact of an order which will enable a targeted number of families belonging to a scheduled tribe community cross the poverty line.

In other words this indicates adoption of well calculated step for increasing income level of the tribal families by widening the scope of family oriented programmes. Thus the economic development becomes the primary concern. It is a common experience that the exploitative process gradually becomes strengthened side by side with the developmental programmes. Therefore, for achieving the target the step needed at the very beginning is to adopt adequate measures for saving the tribals in general from economic and other social, political deprivation. The forest policy, excise policy, land alienation, marketing especially of forest produce are to be closely examined in relation to the tribal way of life and culture, and in context of prevailing tribal situation in different regions of the State.

The Working Group on Development and Welfare of STs during VIII Plan observed that TSP has been found fruitful though these are not in proportion to the investment made. Therefore, the area that is to be tackled first during VIII Plan period is relating to the quantification of funds, backed by decentralised planning which will envisage preparation of ITDP wise plans and adoption of suitable administrative structure at the ITDP level armed with authority.

The Working Group further felt that greater emphasis need to be laid on development of education and development of vulnerable groups including participation of tribal women in conservation of forests, preservation of ecology, land development and preservation of tribal culure. Adequate socio-economic rehabilitation of displaced tribals,preserving their cultural integrity is to be ensured side by side, there is a strong concomitant need for straight implementation of protective laws to ensure that benefits of economic development are not taken away from the tribals (land alienation, indebtedness etc.).

The pre-requisite for formulation and implementation of any development project is a thorough knowledge about the socio-cultural situation and historical process of development of a particular ethnic group or a section of a community or a group of individuals along with a clear cut idea about the ecosystem of their locality. These will help in selecting programmes on priority basis for each area, community, section thereof or individuals concerned. Side by side, the clear conception about the methodology of approach is required. All these are necessary as because no single cause can be made responsible for economic underdevelopment and or cultural stagnation. A number of factors and forces (economic, social, political, religious, historical, cultural) singularly or jointly give rise to a particular situation of underdevelopment and cultural stagnation.

Present day outburst here and there in tribal areas and other experiences reveal that the development programmes have in a direct or an indirect way widened the psychological gap between the tribals and non-tribals and implementing agencies. The atmosphere of distrust and lack of confidence are not congenial for development activities.

Keeping the above facts in view, some of the leading emergent issues concerning tribal development are mentioned below in a nut-shell.

1. The tribal population in general still suffer from mental isolation due to lack of confidence in them. The outsiders are in general considered as 'exploiters' due to historical tradition.
2. It is to be examined how far the basic principle of tribal development that is, "the tribals should develop in accordance with their own genious" still holds effective and meaningful under the existing tribal situation.
3. A portion of tribal population still remains out side the operation of tribal sub-plan. Therefore, suitable step is to be devised for bringing the remaining portion in the development fold. Otherwise the situation may lead to widening of the gap between tribals living in sub plan area and those remaining outside.
4. A major portion of the administrative machinery involved with the sub-plan activities is neither conscious about the seriousness of the prevailing tribal situation nor fully aware of the concept and mechanism of operation of sub-plan.
5. Side by side, the functionaries lack in sufficient knowledge about the tribal life and activities, their culture, mode of thinking, their level of aspiration, etc. which are prerequisite for any development activity.
6. Serious attempt is therefore, called for keeping abreast all the functionaries of tribal development administration with the latest situation prevailing in each area through intensive and peripitatic training otherwise there remains scope for non-appreciation of the proper approach needed for the purpose.
7. Suitable means are to be found out to see how far the local indigenous institutions can be best utilised for development purpose for ensuring meaningful participation of the concerned population. This will help in creating confidence.
8. It is accepted that the Village Panchayat should oversee all developmental programmes in the tribal areas. In this connection, it is to be examined whether the traditional tribal Panch (community council) can also be associated with the development process so as to ensure a bigger participation from the tribal side.
9. An emergent consciousness for self indentification poses a great challenge. This is to be taken note of while drawing up plans and programmes. Maximum effort is to be made so that a batch of efficient workers from amongst the tribals themselves are trained and involved in the process of development.
10. The present administrative machinery is to be properly equipped and the monitoring system should be geared up and made quite effective.
11. At present there is no systematic mechanism for flow of information at various levels. This should be formalised so that there remains no scope for communication gap between different functionaries.

12. The spirit of 'cooperation' is the fundamental principle of tribal society. The expected roles of the LAMPS are yet to be fulfilled.

13. There is need of change in approach and attitude towards the tribals. Instead of working for them, we should work with them.

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COMMUNICATING ADDRESS : Dr. A. K. Das, Former Director,
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Res : 22A, Garcha First Lane, Calcutta – 700 019.

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